Chapter 4

Air Basin Trends and Forecasts -- Criteria Pollutants

Introduction

This chapter includes information about criteria pollutant emission and air quality trends in California's five most populated air basins: the South Coast Air Basin, the San Francisco Bay Area Air Basin, the San Joaquin Valley Air Basin, the San Diego Air Basin, and the Sacramento Valley Air Basin. The primary focus of the chapter is ozone, particulate matter (PM_{10} and $PM_{2.5}$), and carbon monoxide (CO). However, information on nitrogen dioxide (NO_2) is included for the South Coast Air Basin and San Diego Air Basin. Although these areas were once designated as nonattainment for NO_2, both areas now attain the nitrogen dioxide standards

The introduction section for each air basin includes a description of the area, a discussion of the emission trends and forecasts for each pollutant, and a description of the changes in population and the number of vehicle miles traveled each day in the air basin. This introduction is followed by more detailed discussions of trends and forecasts in emissions by major source categories and trends in ambient air quality, organized by pollutant.

The emissions discussion for each air basin includes information on both PM_{10} and $PM_{2.5}$. In contrast, the air quality discussion includes only PM_{10}. At this time, air quality information for $PM_{2.5}$ is limited, and not yet sufficient for trends analysis. However, those $PM_{2.5}$ data that are available are summarized in Chapter 2.

South Coast Air Basin

Introduction - Area Description

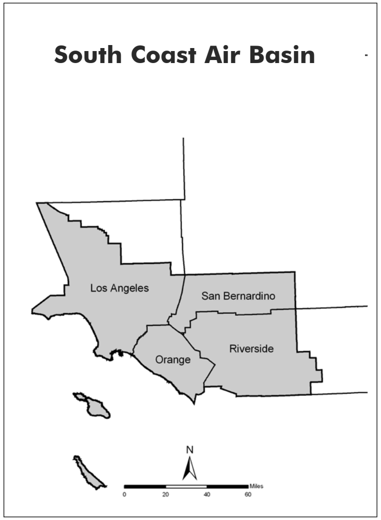

Figure 4-1

The South Coast Air Basin is California's largest metropolitan region. The area includes the southern two-thirds of Los Angeles County, all of Orange County, and the western urbanized portions of Riverside and San Bernardino counties. It covers a total of 6,480 square miles, is home to more than 43 percent of California's population, and generates about 29 percent of the State's total criteria pollutant emissions.

The South Coast Air Basin generally forms a lowland plain, bounded by the Pacific Ocean on the west and by mountains on the other three sides. In terms of air pollution potential, there are probably few areas less suited for urban development. The warm sunny weather associated with a persistent high pressure system is conducive to the formation of ozone, commonly referred to as "smog." The problem is further aggravated by the surrounding mountains, frequent low inversion heights, and stagnant air conditions. All of these factors act together to trap pollutants in the air basin.

Pollutant concentrations in parts of the South Coast Air Basin are among the highest in California. As a result, controlling the contributing emission sources poses a great challenge to State and local air pollution control agencies.

South Coast Air Basin

Emission Trends and Forecasts

Overall, since 1975 the emission levels for CO and the ozone precursors NO_x and ROG have been decreasing in the South Coast Air Basin and are projected to continue decreasing through 2010. The decreases are predominantly due to motor vehicle controls and reductions in evaporative emissions. In the South Coast Air Basin, on-road motor vehicles are the largest contributors to CO, NO_x, and ROG emissions. Other mobile sources are also significant contributors to CO and NO_x emissions. State Implementation Plan (SIP) and conformity inventory forecasts may differ from the forecasts presented in this almanac. For more information on these forecasts, please see the ARB SIP web page at *www.arb.ca.gov/sip/sip.htm*.

South Coast Air Basin

Population and VMT

Both population and the daily number of vehicle miles traveled, or VMT, will grow at high rates in the South Coast Air Basin from 1980 to 2010. The population is projected to increase almost 60 percent -- from about 10.6 million in 1980 to almost 17 million in 2010. During the same general period, the number of vehicle miles traveled each day is projected to increase 127 percent -- from 158 million miles per day in 1980 to almost 359 million miles per day in 2010. While high growth rates are often associated with corresponding increases in emissions and pollutant concentrations, aggressive emission control programs in the South Coast Air Basin have resulted in emission decreases and a continuing improvement in air quality.

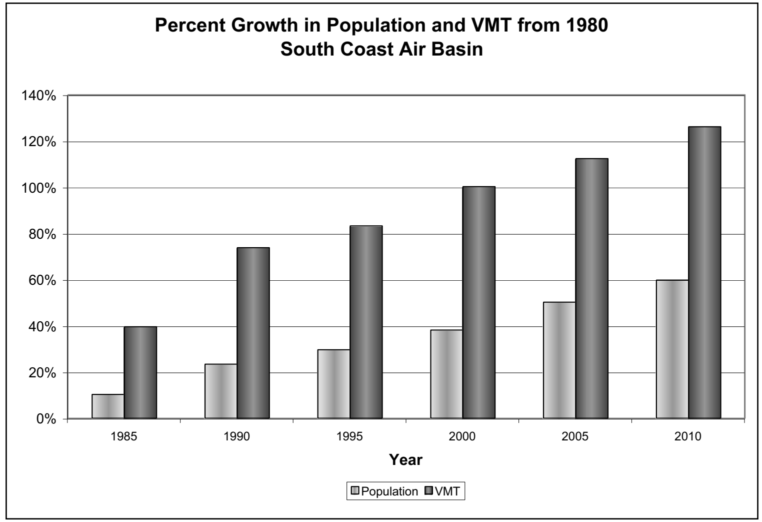

Figure 4-2

South Coast Air Basin
Ozone Precursor Emission Trends and Forecasts

Emissions of the ozone precursors NO_x and ROG in the South Coast Air Basin are generally following the statewide downward trend. Motor vehicle miles traveled in the basin are increasing, but NO_x and ROG emissions from on-road vehicles are dropping as more stringent vehicle emission standards have been adopted. These decreases in NO_x and ROG emissions are projected to continue between 2000 and 2010, as even more stringent motor vehicle standards are implemented and as newer, lower-emitting vehicles become a larger percentage of the fleet. NO_x emissions from electric utilities in the air basin have declined substantially since 1975, despite a nationwide increase in emissions from electric utilities in the same time period. These large reductions are primarily due to increased use of natural gas as the principal fuel for power plants, and control rules that limit NO_x emissions.

NO_x Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***1724***	***1642***	***1742***	***1565***	***1341***	***1182***	***968***	***762***
Stationary Sources	328	292	255	164	131	91	68	65
Area-wide Sources	31	34	35	28	27	30	32	27
On-Road Mobile	1026	954	1094	1000	869	751	581	426
Gasoline Vehicles	921	768	788	700	594	432	270	186
Diesel Vehicles	105	186	306	299	275	319	311	239
Other Mobile	339	362	358	373	314	309	287	243

Table 4-1

ROG Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***2636***	***2232***	***2187***	***1639***	***1201***	***995***	***714***	***607***
Stationary Sources	572	439	428	349	184	195	139	148
Area-wide Sources	192	208	230	203	184	191	168	158
On-Road Mobile	1684	1387	1317	860	618	413	276	196
Gasoline Vehicles	1678	1376	1299	845	606	402	265	187
Diesel Vehicles	6	12	18	15	12	11	11	9
Other Mobile	188	198	212	228	215	196	131	104

Table 4-2

South Coast Air Basin
Ozone Precursor Emission Trends and Forecasts

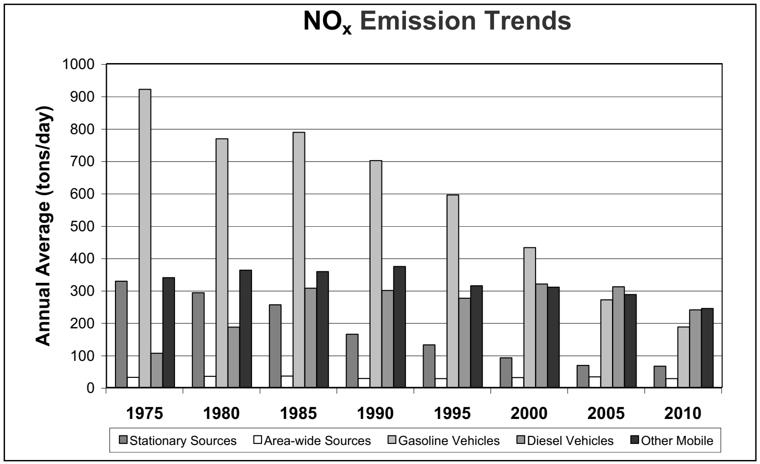

Figure 4-3

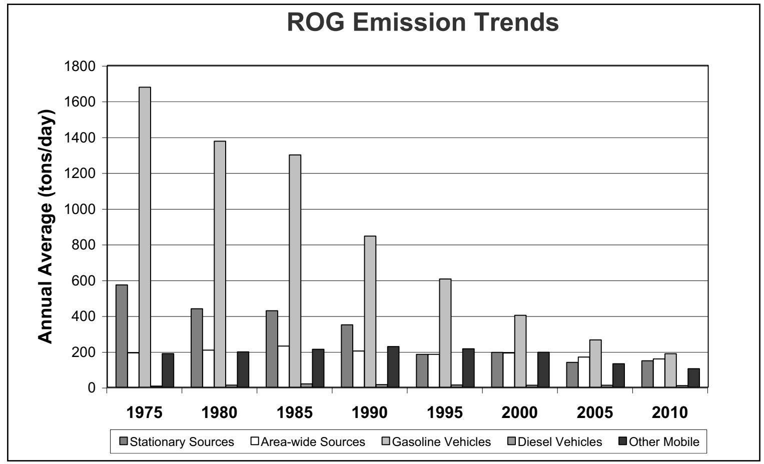

Figure 4-4

South Coast Air Basin

Ozone Air Quality Trend

Air quality as it relates to ozone in the South Coast Air Basin has improved substantially over the last 30 years. During the 1960s, maximum 1-hour concentrations were above 0.60 parts per million. Today, the maximum measured concentrations are less than one-third of that. All of the ozone statistics show an overall, steady decline. The 2003 peak 1-hour indicator value is more than 51 percent lower than the 1983 value. The maximum 1-hour concentration has also decreased more than 50 percent. The number of days above the standards has declined dramatically, as have the number of Stage I and Stage II episode days.

In July 2003, the South Coast Air Basin experienced its first Stage 1 smog alert since 1998. The Basin also had a greater number of days exceeding the ozone standards than in the previous five years. An analysis of the weather indicated that there were more days in 2003 with the potential to produce high ozone than in any of the last 24 years. This increased potential contributed to the severity of the 2003 ozone season.

The ARB has identified the South Coast Air Basin as a transport contributor to several downwind areas -- the Mojave Desert Air Basin, the Salton Sea Air Basin, the San Diego Air Basin, and the South Central Coast Air Basin. As ozone concentrations in the South Coast Air Basin decline further, the transport impact on the downwind areas should also decrease.

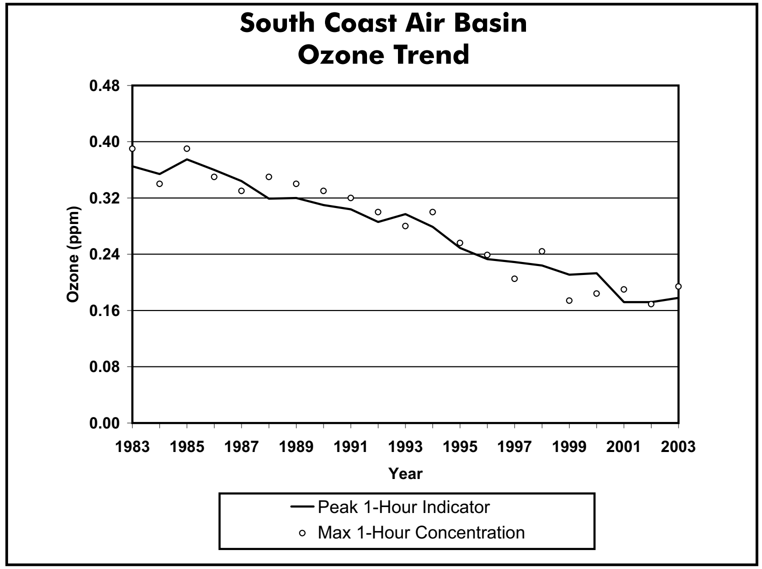

Figure 4-5

South Coast Air Basin

Ozone Air Quality Table

OZONE (ppm)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003[1]
Peak 1-Hour Indicator	0.365	0.354	0.375	0.360	0.344	0.319	0.320	0.310	0.304	0.286	0.297	0.279	0.249	0.233	0.229	0.224	0.211	0.213	0.172	0.172	0.178
4th High 1-Hr in 3 Yrs	0.360	0.360	0.360	0.350	0.350	0.340	0.330	0.330	0.310	0.300	0.300	0.280	0.250	0.231	0.215	0.217	0.211	0.211	0.170	0.169	0.180
Avg of 4th Hi 8-Hr in 3 Yrs	0.229	0.225	0.226	0.222	0.217	0.205	0.192	0.186	0.182	0.18	0.177	0.171	0.165	0.161	0.148	0.154	0.147	0.146	0.129	0.128	0.131
Maximum 1-Hr. Concentration	0.390	0.340	0.390	0.350	0.330	0.350	0.340	0.330	0.320	0.300	0.280	0.300	0.256	0.239	0.205	0.244	0.174	0.184	0.190	0.169	0.194
Max. 8-Hr. Concentration	0.258	0.248	0.288	0.251	0.210	0.258	0.252	0.193	0.203	0.218	0.195	0.208	0.203	0.173	0.148	0.206	0.142	0.149	0.144	0.144	0.153
Days Above State Standard	192	209	207	217	196	216	211	185	184	190	185	165	153	141	144	107	111	115	121	116	125
Days Above Nat. 1-Hr. Std.	153	175	158	167	161	178	157	131	130	142	124	118	98	85	64	60	39	33	36	45	64
Days Above Nat. 8-Hr. Std.	169	190	181	191	179	194	181	161	160	173	161	148	120	115	118	93	93	94	92	96	109

[1]The data do not reflect the Stage 1 smog alert of 0.220 ppm that occurred at Rim of the World monitoring site on July 11, 2003. This is a special purpose monitoring site, and is not part of the official data used for regulatory purposes.

Table 4-3

South Coast Air Basin

Directly Emitted PM_{10} Emission Trends and Forecasts

Direct emissions of PM_{10} have been increasing in the South Coast Air Basin since 1975. A decrease in emissions would have been observed, if not for growth in emissions from area-wide sources, primarily fugitive dust from paved and unpaved roads and other sources. The increase in activity of these area-wide sources reflects the increased growth and vehicle miles traveled (VMT) in the air basin.

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NOx, SOx, ROG, and ammonia (secondary PM). The PM_{10} emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted PM_{10} emissions contribute approximately 65 percent of the ambient PM_{10} in the South Coast Air Basin.

Directly Emitted PM10 Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***233***	***243***	***271***	***338***	***320***	***288***	***291***	***297***
Stationary Sources	55	38	26	26	17	16	16	17
Area-wide Sources	140	162	196	264	264	233	235	242
On-Road Mobile	15	17	24	22	19	19	19	19
Gasoline Vehicles	10	8	9	10	11	12	13	15
Diesel Vehicles	5	9	15	12	8	6	6	4
Other Mobile	24	25	25	26	21	21	21	19

Table 4-4

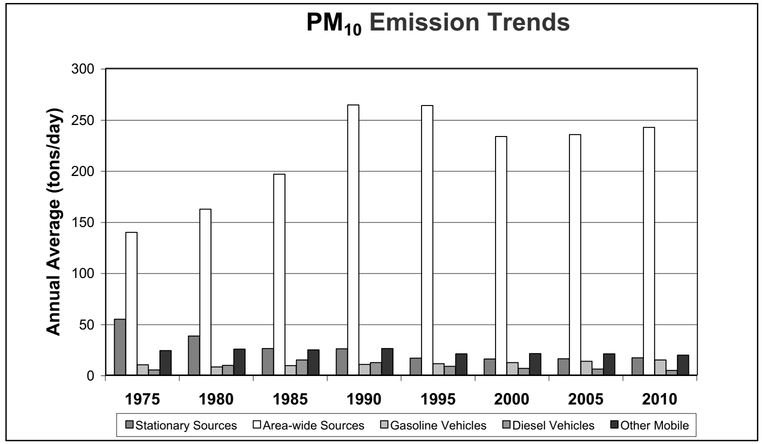

Figure 4-6

South Coast Air Basin

Directly Emitted $PM_{2.5}$ Emission Trends and Forecasts

Direct emissions of $PM_{2.5}$ are increasing in the South Coast Air Basin since 1975. Stationary source emissions have been decreasing, while area-wide emissions have been increasing. A decrease in emissions would have been observed, if not for growth in emissions from area-wide sources, primarily fugitive dust from paved and unpaved roads and other sources. The increase in activity of these area-wide sources reflects the increased growth and vehicle miles traveled (VMT) in the air basin.

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NOx, SOx, ROG, and ammonia (secondary PM). The $PM_{2.5}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{2.5}$ emissions contribute approximately 40 percent of the ambient $PM_{2.5}$ in the South Coast Air Basin.

Directly Emitted $PM_{2.5}$ Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***118***	***108***	***110***	***120***	***106***	***104***	***106***	***107***
Stationary Sources	51	32	21	22	14	13	13	14
Area-wide Sources	35	40	48	59	59	60	61	63
On-Road Mobile	11	13	19	17	14	13	13	13
Gasoline Vehicles	6	5	5	6	6	7	8	9
Diesel Vehicles	5	9	14	11	8	6	5	4
Other Mobile	22	23	22	23	18	19	18	17

Table 4-5

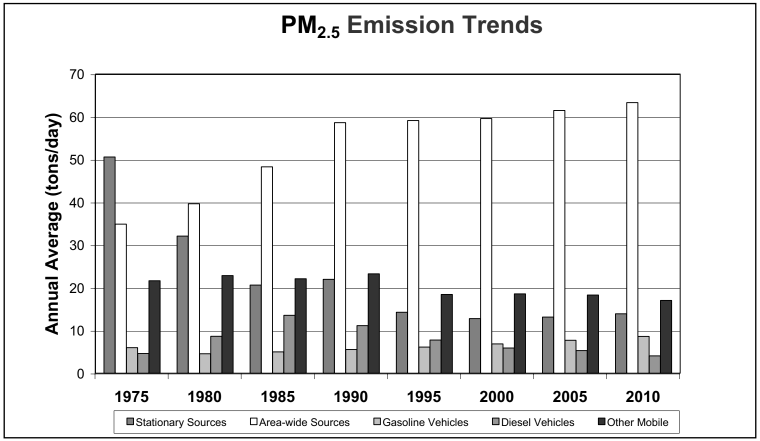

Figure 4-7

South Coast Air Basin

PM_{10} Air Quality Trend

As with other pollutants, the PM_{10} statistics also show overall improvement. During the period for which data are available, the maximum annual average of quarters (state) decreased about 37 percent. Although the values for the last several years show some variability, this is probably due to meteorology rather than a change in emissions. Despite the overall decrease, ambient concentrations still exceed the State annual and 24-hour PM_{10} standards. Similar to the ambient concentrations, the calculated number of days above the 24-hour PM_{10} standards has also shown an overall drop. During 1988, there were 345 calculated days above the State standard and 44 calculated days above the national standard. By 2002, there were still 297 calculated State standard exceedance days. In contrast, there were no national standard exceedance days.

Despite these decreases, PM_{10} continues to pose a significant problem in the South Coast Air Basin. While emission controls implemented for ozone will also benefit PM_{10}, more controls aimed specifically at reducing PM_{10} will be needed to reach attainment.

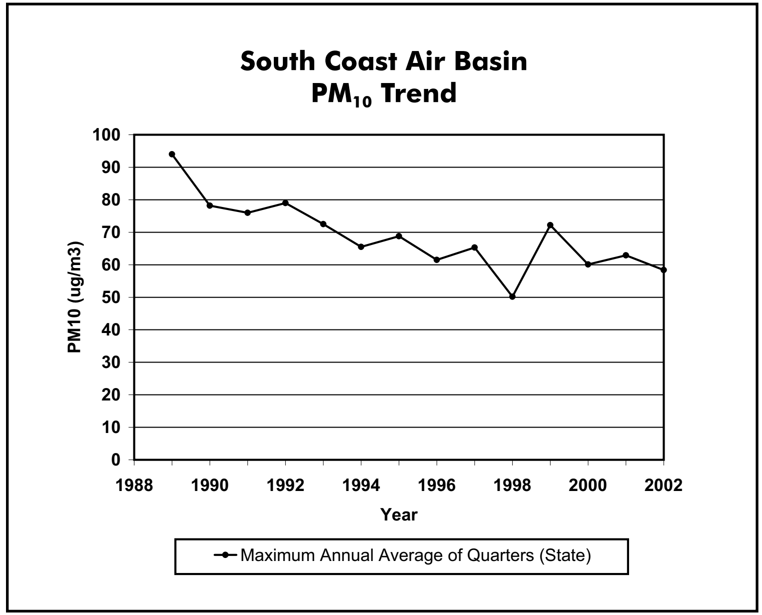

Figure 4-8

South Coast Air Basin

PM_{10} Air Quality Table

PM_{10} (ug/m3)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Max. 24-Hour Concentration (State)						287	271	475	179	649	231	161	219	162	208	116	183	139	219	130
Max. 24-Hr. Concentration (Nat)						289	271	475	179	649	231	161	219	162	208	116	183	139	219	130
Max. Annual Avg of Qrtrs (State)							94.0	78.2	76.0	79.0	72.5	65.5	68.8	61.5	65.3	50.2	72.2	60.1	62.9	58.4
Max. Annual Avg of Qrtrs (Nat)						94.5	93.0	78.2	76.1	79.0	72.5	65.5	68.8	62.8	65.6	50.2	72.2	59.1	63.3	58.1
Calc Days Above State 24-Hr Std						345	338	301	294	282	293	276	252	276	290	238	288	300	278	297
Calc Days Above Nat 24-Hr Std						44	32	33	15	24	12	3	31	6	17	0	6	0	5	0

Table 4-6

South Coast Air Basin
Carbon Monoxide Emission Trends and Forecasts

Emissions of CO have been trending downward since 1975 in the South Coast Air Basin even though motor vehicle miles traveled have increased and industrial activity has grown. On-road motor vehicle controls are primarily responsible for this decline in emissions of CO. Stationary source emissions decreased during the 1970s and 1980s as a result of a decline in the manufacture of carbon black (a material used in the manufacture of tires) and steel in the South Coast Air Basin. CO emissions from other mobile sources are projected to decrease as more stringent emission standards are adopted.

CO Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***16154***	***13381***	***13139***	***10322***	***7606***	***5552***	***3941***	***3051***
Stationary Sources	295	286	74	99	96	70	75	78
Area-wide Sources	54	51	82	70	87	142	158	161
On-Road Mobile	14571	11754	11622	8690	6153	4207	2705	1883
Gasoline Vehicles	14546	11708	11545	8623	6093	4154	2654	1839
Diesel Vehicles	25	47	78	67	60	52	51	44
Other Mobile	1233	1290	1361	1463	1269	1133	1004	929

Table 4-7

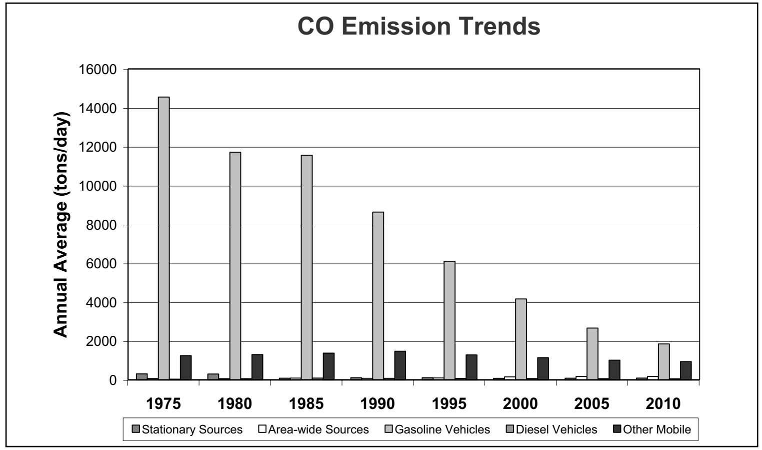

Figure 4-9

South Coast Air Basin

Carbon Monoxide Air Quality Trend

Carbon monoxide concentrations in the South Coast Air Basin have decreased markedly -- a total decrease of 55 percent in the maximum peak 8-hour indicator since 1983. The number of standard exceedance days has also declined. There were 67 days above the State standard and 57 days above the national standard during 1983. However, during 2002, there was only one exceedance day for each.

While the entire South Coast Air Basin is designated as non-attainment for the national CO standards and Los Angeles County is designated as nonattainment for the State standards, CO violations have been limited to a small portion of Los Angeles County. The South Coast Air Basin now qualifies as attainment for the national CO standard, and is expected to reach attainment of the State CO standard within the next three years. No violations have occurred in the other three counties since 1992. Continuing reductions in motor vehicle emissions should continue reducing ambient CO concentrations.

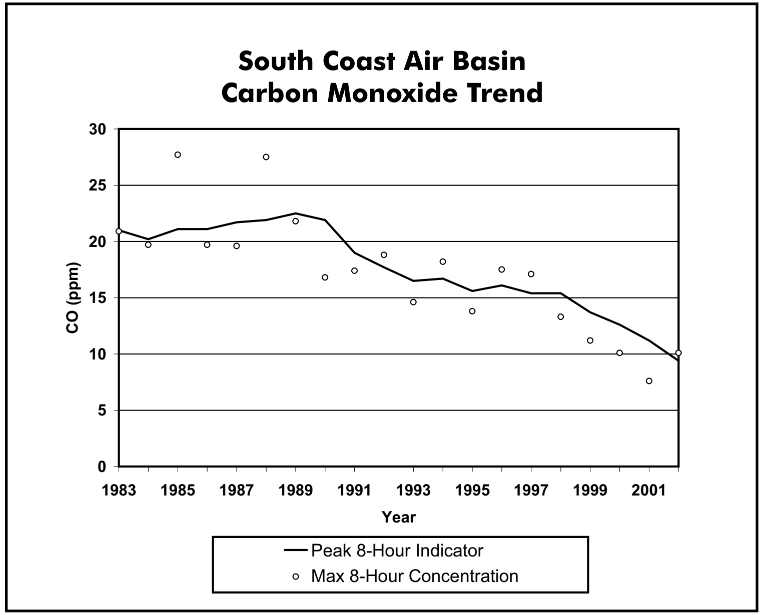

Figure 4-10

South Coast Air Basin

Carbon Monoxide Air Quality Table

CARBON MONOXIDE (ppm)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Peak 8-Hr. Indicator	21.0	20.2	21.1	21.1	21.7	21.9	22.5	21.9	19.0	17.7	16.5	16.7	15.6	16.1	15.4	15.4	13.7	12.6	11.2	9.4
Max. 1-Hr. Concentration	31.0	29.0	33.0	27.0	26.0	32.0	31.0	24.0	30.0	28.0	21.0	24.9	16.8	22.5	19.2	17.0	19.0	13.8	11.7	15.8
Max. 8-Hr. Concentration	20.9	19.7	27.7	19.7	19.6	27.5	21.8	16.8	17.4	18.8	14.6	18.2	13.8	17.5	17.1	13.3	11.2	10.1	7.6	10.1
Days Above State 8-Hr. Std.	67	79	64	58	50	73	71	50	51	39	29	27	17	26	18	13	11	6	0	1
Days Above Nat. 8-Hr. Std.	57	66	54	49	40	65	67	42	41	34	19	19	14	19	13	10	7	3	0	1

Table 4-8

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South Coast Air Basin

Nitrogen Dioxide

Oxides of Nitrogen Emission Trends and Forecasts

NO_x (and nitrogen dioxide) emissions in the South Coast Air Basin have been trending downward since 1985. This decline should continue as more stringent motor vehicle and stationary source emission standards are adopted and implemented.

NOx Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***1724***	***1642***	***1742***	***1565***	***1341***	***1182***	***968***	***762***
Stationary Sources	328	292	255	164	131	91	68	65
Area-wide Sources	31	34	35	28	27	30	32	27
On-Road Mobile	1026	954	1094	1000	869	751	581	426
Gasoline Vehicles	921	768	788	700	594	432	270	186
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Table 4-9

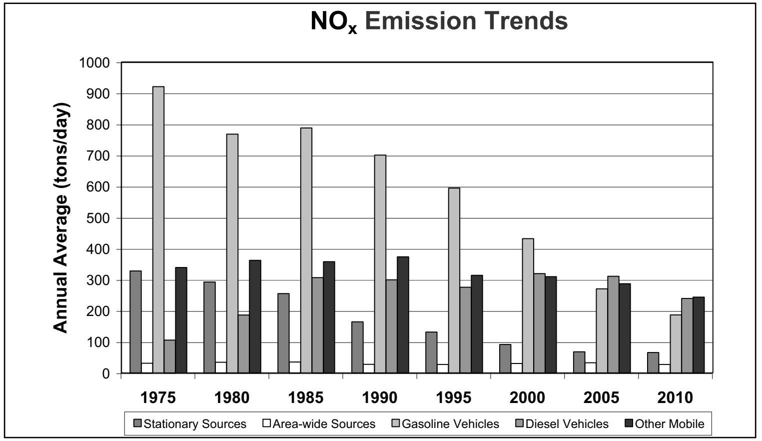

Figure 4-11

South Coast Air Basin

Nitrogen Dioxide Air Quality Trend

The South Coast Air Basin is one of only a few areas in California where nitrogen dioxide has been a problem. The South Coast Air Basin attained the State 1-hour NO_2 standard in 1994, bringing the entire State into attainment. The federal standard has not been exceeded since 1991.

Over the last 20 years, NO_2 values have decreased significantly in the South Coast Air Basin. The peak 1-hour indicator for 2002 was nearly half of what it was during 1983, a 47 percent decrease. However, since the early 1990's, maximum 1-hour NO_2 concentrations that exceed the level of the State standard have occasionally occurred but have not affected the area's attainment status. These exceedances have been very infrequent and limited to either the Banning Airport or the Burbank-West Palm Avenue monitoring sites. Additional years of data will be needed to determine if there is any long-term change in NO_2 trends in the South Coast Air Basin.

Nitrogen dioxide is formed from emissions of oxides of nitrogen, which also contribute to ozone. As a result, the majority of the future emission control measures will be implemented as part of the overall ozone control strategy. Many of these control measures will target mobile sources, which account for more than three-quarters of California's oxides of nitrogen emissions.

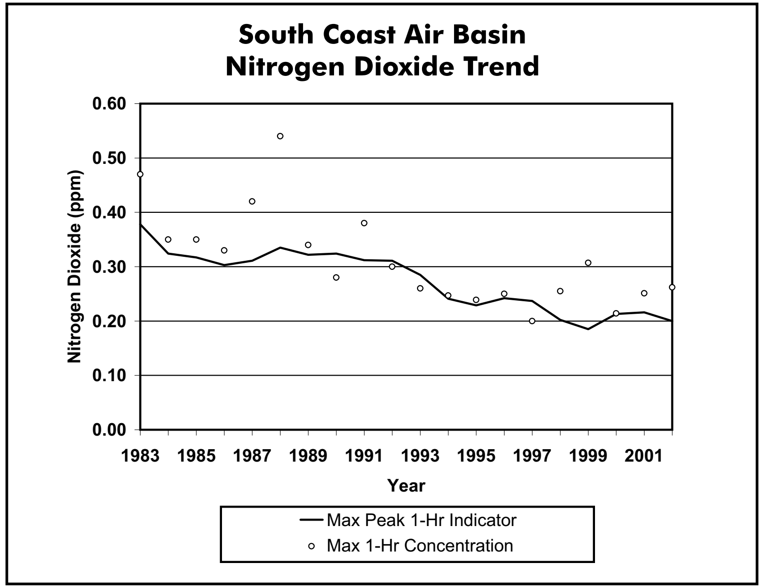

Figure 4-12

South Coast Air Basin

Nitrogen Dioxide Air Quality Table

NITROGEN DIOXIDE (ppm)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Peak 1-Hr. Indicator	0.378	0.324	0.317	0.303	0.311	0.335	0.322	0.324	0.312	0.311	0.285	0.241	0.229	0.242	0.237	0.202	0.185	0.213	0.216	0.200
Max. 1-Hr. Concentration	0.470	0.350	0.350	0.330	0.420	0.540	0.340	0.280	0.380	0.300	0.260	0.247	0.239	0.250	0.200	0.255	0.307	0.214	0.251	0.262
Max. Annual Average	0.059	0.057	0.060	0.061	0.055	0.061	0.057	0.055	0.055	0.051	0.050	0.050	0.046	0.042	0.043	0.043	0.051	0.044	0.041	0.040

Table 4-10

San Francisco Bay Area Air Basin

Introduction - Area Description

Figure 4-13

The San Francisco Bay Area is California's second largest metropolitan area and is the focal point of northern California. The nine county area comprises all of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara counties, the southern half of Sonoma County, and the southwestern portion of Solano County. The unifying feature of the area is the Bay itself, which is oriented north-south and covers about 400 square miles of the area's total 5,340 square miles. Over 19 percent of California's population resides in the San Francisco Bay Area, and pollution sources in the region account for about 16 percent of the total statewide criteria pollutant emissions. The climate in the San Francisco Bay Area varies from one location to the next. Along the coast, temperatures are mild year-round. However, as one moves inland, temperatures show larger diurnal and seasonal variations. Overall air quality in the San Francisco Bay Area Air Basin is better than in the South Coast Air Basin. This is due to a more favorable climate, with cooler temperatures and better ventilation. However, exceedances of the ozone standards continue to occur in the San Francisco Bay Area Air Basin, and still pose challenges to State and local air pollution control agencies.

San Francisco Bay Area Air Basin
Emission Trends and Forecasts

The emission levels for the ozone precursors NO_x and ROG have been trending downward in the San Francisco Bay Area Air Basin since 1975 and 1980, respectively. CO emissions have also been trending downward since 1975. On-road motor vehicles are the largest contributors to CO, ROG, and NO_x emissions in the air basin. The implementation of stricter mobile source (both on-road and other) emission standards will continue to decrease vehicle emissions in this air basin. Controls on stationary source solvent evaporation and fugitive emissions will also continue to impact ROG emissions.

San Francisco Bay Area Air Basin

Population and VMT

Compared with the statewide totals, population and the number of vehicle miles traveled each day is projected to grow at a slower rate in the San Francisco Bay Area Air Basin from 1980 to 2010. During that 30-year period, the population is projected to increase about 48 percent, from about 5.1 million in 1980 to more than 7.5 million in 2010. During the same period, the daily VMT is projected to increase 114 percent, from 90 million miles per day in 1980 to over 193 million miles per day in 2010. While these growth rates are lower than the growth rates seen in other areas, they still represent substantial increases.

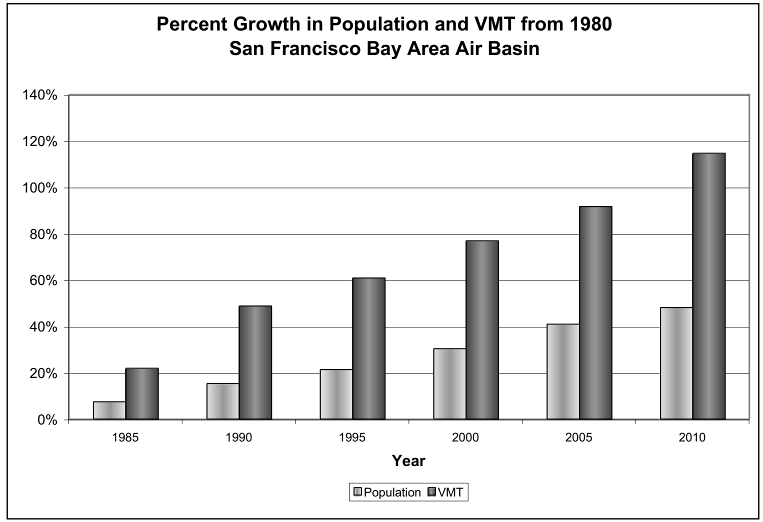

Figure 4-14

San Francisco Bay Area Air Basin

Ozone Precursor Emission Trends and Forecasts

Emissions of ozone precursors have decreased in the San Francisco Bay Area Air Basin since 1975 and are projected to continue declining through 2010. The Bay Area has a significant motor vehicle population, and the implementation of stricter motor vehicle controls has resulted in significant emissions reductions for NO_x and ROG. Stationary source emissions of ROG have declined over the last 20 years due to new controls for oil refinery fugitive emissions and new rules for control of ROG from various industrial coatings and solvent operations.

NOx Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***975***	***968***	***905***	***876***	***741***	***694***	***542***	***453***
Stationary Sources	231	208	136	132	103	145	73	77
Area-wide Sources	14	15	16	19	20	20	20	20
On-Road Mobile	552	570	566	524	437	352	286	217
Gasoline Vehicles	497	478	417	348	294	208	155	114
Diesel Vehicles	55	92	149	176	142	144	131	103
Other Mobile	178	175	186	200	182	177	163	139

Table 4-11

ROG Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***1445***	***1378***	***1119***	***793***	***637***	***496***	***397***	***344***
Stationary Sources	318	306	214	125	119	99	90	90
Area-wide Sources	161	154	143	136	104	98	91	91
On-Road Mobile	873	822	658	421	309	208	152	113
Gasoline Vehicles	869	816	649	413	303	202	146	108
Diesel Vehicles	3	6	9	8	6	6	6	5
Other Mobile	94	96	104	112	105	92	64	50

Table 4-12

San Francisco Bay Area Air Basin
Ozone Precursor Emission Trends and Forecasts

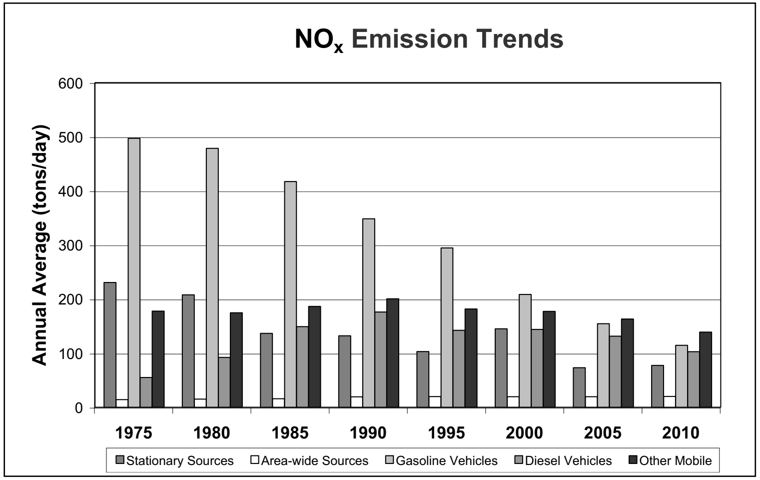

Figure 4-15

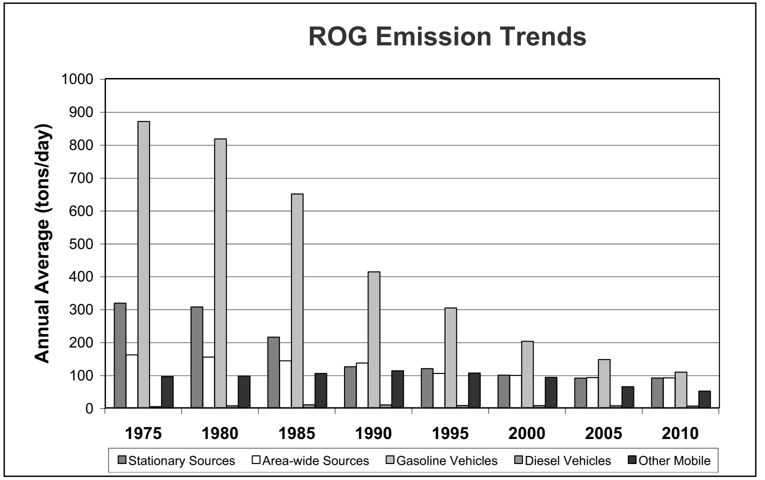

Figure 4-16

San Francisco Bay Area Air Basin

Ozone Air Quality Trend

Ozone concentrations in the San Francisco Bay Area are much lower than in the South Coast Air Basin. The peak 1-hour indicator declined about 15 percent from 1983 to 2003. Although the trend has not been consistently downward, the ambient concentrations generally declined from 1983 to 1994. Since 1994, the peak indicator values have been somewhat higher. However, it is not yet clear whether these data represent a significant change in the overall trend. Data for 2001 through 2003 are lower than values during the prior few years. The number of days above the State 1-hour and national 8-hour standards show a similar trend.

Bacause of meteorology, ozone and ozone precursor emissions can be transported from one air basin to another. The ARB has identified the San Francisco Bay Area Air Basin as a transport contributor to the following six areas: the Sacramento region, the Mountain Counties Air Basin, the North Central Coast Air Basin, the North Coast Air Basin, the San Joaquin Valley Air Basin, and the South Central Coast Air Basin. The amount of transport impact varies from day to day, depending in large part on meteorology. To the extent that the Bay Area continues to reduce ozone precursor emissions, the transport impact on downwind areas should also decrease.

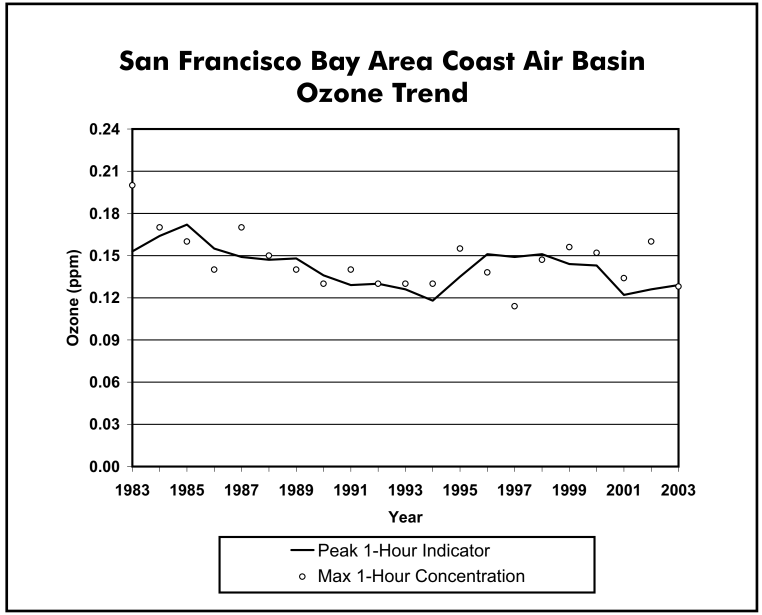

Figure 4-17

San Francisco Bay Area Air Basin

Ozone Air Quality Table

OZONE (ppm)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Peak 1-Hour Indicator	0.153	0.164	0.172	0.155	0.149	0.147	0.148	0.136	0.129	0.130	0.126	0.118	0.135	0.151	0.149	0.151	0.144	0.143	0.122	0.126	0.129
4th High 1-Hr in 3 Yrs	0.160	0.160	0.160	0.150	0.140	0.140	0.140	0.130	0.130	0.120	0.120	0.121	0.138	0.138	0.138	0.138	0.139	0.139	0.126	0.124	0.123
Avg of 4th Hi 8-Hr in 3 Yrs	0.095	0.100	0.103	0.097	0.092	0.092	0.097	0.088	0.084	0.082	0.081	0.082	0.087	0.093	0.090	0.089	0.086	0.087	0.082	0.082	0.086
Maximum 1-Hr. Concentration	0.200	0.170	0.160	0.140	0.170	0.150	0.140	0.130	0.140	0.130	0.130	0.130	0.155	0.138	0.114	0.147	0.156	0.152	0.134	0.160	0.128
Max. 8-Hr. Concentration	0.150	0.124	0.127	0.106	0.116	0.101	0.102	0.105	0.108	0.101	0.112	0.097	0.115	0.112	0.084	0.111	0.122	0.114	0.102	0.106	0.101
Days Above State Standard	53	55	45	39	46	41	22	14	23	23	19	13	28	34	8	29	20	12	15	16	19
Days Above Nat. 1-Hr. Std.	21	22	9	5	14	5	4	2	2	2	3	2	11	8	0	8	3	3	1	2	1
Days Above Nat. 8-Hr. Std.	26	32	17	13	29	20	13	7	6	6	5	4	18	14	0	16	9	4	7	7	7

Table 4-13

San Francisco Bay Area Air Basin

Directly Emitted PM_{10} Emission Trends and Forecasts

Direct emissions of PM_{10} increase in the San Francisco Bay Area Air Basin between 1975 and 2010. This increase is due to growth in emissions from area-wide sources, primarily fugitive dust sources. Emissions of directly emitted PM_{10} from diesel motor vehicles have been decreasing since 1990 even though population and vehicle miles traveled (VMT) are growing, due to adoption of more stringent emission standards.

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NOx, SOx, ROG, and ammonia (secondary PM). The PM_{10} emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted PM_{10} emissions contribute approximately 75 percent of the ambient PM_{10} in the San Francisco Bay Area Air Basin.

Directly Emitted PM_{10} Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***183***	***184***	***197***	***196***	***184***	***195***	***205***	***208***
Stationary Sources	36	24	21	17	18	15	17	17
Area-wide Sources	128	139	152	153	145	159	168	170
On-Road Mobile	7	9	12	12	9	9	10	10
Gasoline Vehicles	5	4	4	5	5	6	7	8
Diesel Vehicles	2	5	7	7	4	3	3	2
Other Mobile	12	12	12	14	11	11	11	10

Table 4-14

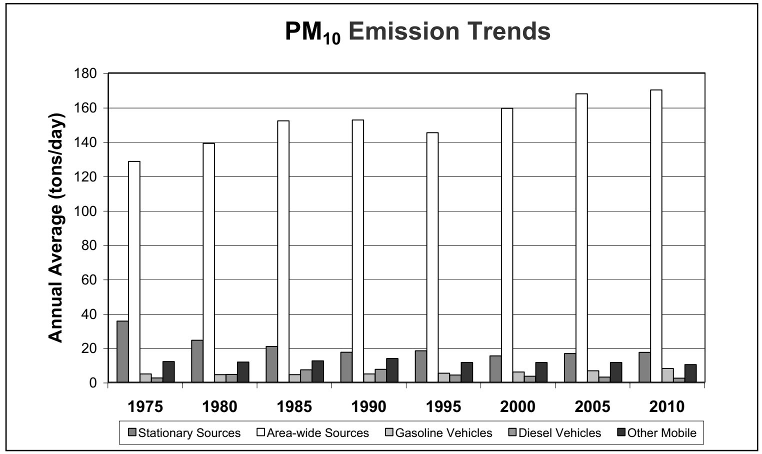

Figure 4-18

San Francisco Bay Area Air Basin

Directly Emitted $PM_{2.5}$ Emission Trends and Forecasts

Direct emissions of $PM_{2.5}$ are declining slightly in the San Francisco Bay Area Air Basin between 1975 and 2010. Emissions from stationary sources declined slightly, while area-wide sources increased. This increase is due to growth in emissions from area-wide sources, primarily fugitive dust sources. Emissions of directly emitted $PM_{2.5}$ from diesel motor vehicles have been decreasing since 1990 even though population and vehicle miles traveled (VMT) are growing, due to adoption of more stringent emission standards.

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NOx, SOx, ROG, and ammonia (secondary PM). The $PM_{2.5}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{2.5}$ emissions contribute approximately 60 percent of the ambient $PM_{2.5}$ in the San Francisco Bay Area Air Basin.

Directly Emitted $PM_{2.5}$ Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***93***	***90***	***90***	***91***	***84***	***84***	***87***	***87***
Stationary Sources	26	20	14	12	14	12	13	13
Area-wide Sources	50	53	55	57	53	56	58	57
On-Road Mobile	5	7	9	9	7	6	7	7
Gasoline Vehicles	3	3	2	3	3	3	4	5
Diesel Vehicles	2	4	7	7	4	3	3	2
Other Mobile	11	11	11	13	10	10	10	9

Table 4-15

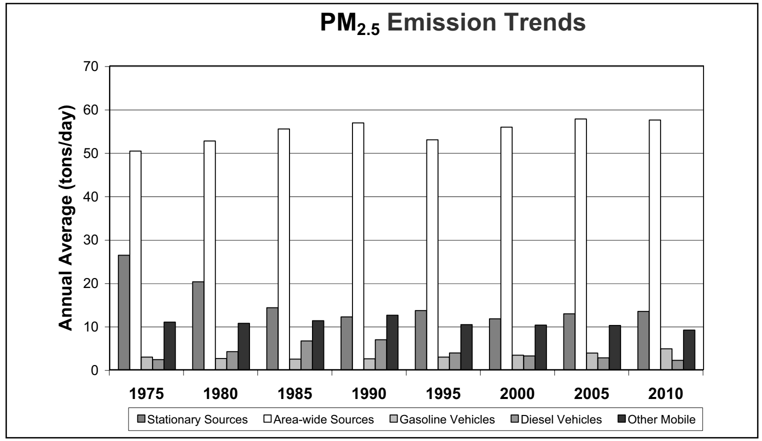

Figure 4-19

San Francisco Bay Area Air Basin

PM_{10} Air Quality Trend

As with other pollutants, the PM_{10} statistics also show overall improvement. During the period for which data are available, the maximum annual average of quarters (state) decreased about 26 percent.

Calculated exceedance days for the State 24-hour standard dropped from a high of 123 days during 1988 to 30 days during 2002. The national 24-hour standard was last exceeded in 1991. Because many of the same sources contribute to both ozone and PM_{10}, future ozone precursor emission controls should help ensure continued PM_{10} improvements.

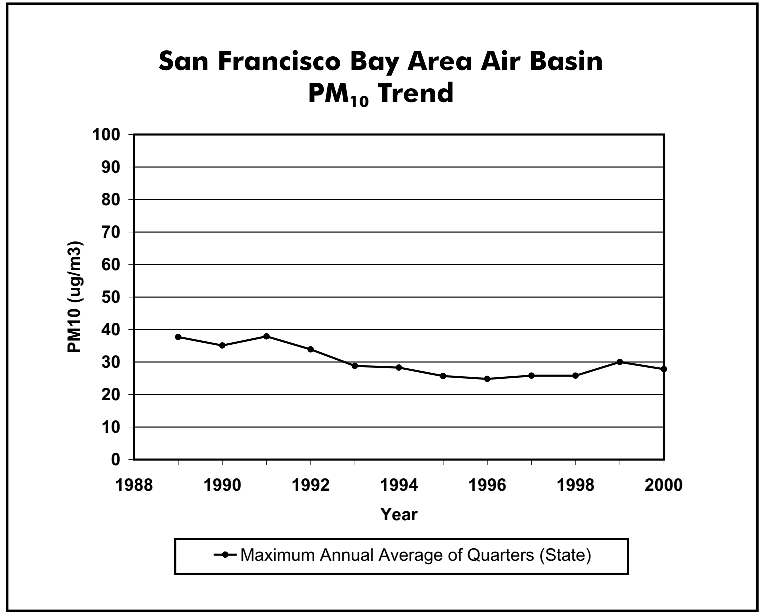

Figure 4-20

San Francisco Bay Area Air Basin

PM_{10} Air Quality Table

PM_{10} (ug/m3)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Max. 24-Hour Concentration (State)						146	147	165	155	112	93	97	74	76	85	100	117	80	114	84
Max. 24-Hr. Concentration (Nat)						146	150	173	155	112	101	97	74	76	95	92	114	76	109	80
Max. Annual Avg of Qrtrs (State)							37.7	35.1	37.9	33.9	28.8	28.3	25.7	24.8	25.8	25.8	30.0	27.8		
Max. Annual Avg of Qrtrs (Nat)						38.3	40.8	40.4	38.3	33.7	28.8	28.3	25.7	24.9	25.8	25.1	28.7	26.8	28.9	25.4
Calc Days Above State 24-Hr Std						123	137	93	125	108	59	54	42	18	20	25	63	42	51	30
Calc Days Above Nat 24-Hr Std						0	0	4	1	0	0	0	0	0	0	0	0	0	0	0

Table 4-16

San Francisco Bay Area Air Basin
Carbon Monoxide Emission Trends and Forecasts

Emissions of CO have been declining in the San Francisco Bay Area Air Basin since 1975. Motor vehicles and other mobile sources are the largest sources of CO emissions in the air basin. Emissions from motor vehicles have been declining, with the introduction of new automotive emission controls, despite increases in vehicle miles traveled (VMT). Oil refineries, manufacturing, and electric generation contribute a significant portion of the stationary source CO emissions. Area-wide CO emissions are primarily from residential fuel combustion (including wood), waste burning, and fires.

CO Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***8956***	***8293***	***7078***	***5241***	***3829***	***2785***	***2206***	***1773***
Stationary Sources	49	58	76	69	60	41	51	55
Area-wide Sources	173	175	176	174	164	170	175	171
On-Road Mobile	8155	7477	6190	4310	2965	2029	1496	1105
Gasoline Vehicles	8142	7454	6152	4270	2934	2001	1470	1082
Diesel Vehicles	13	23	38	39	31	27	26	23
Other Mobile	580	583	636	688	640	545	484	442

Table 4-17

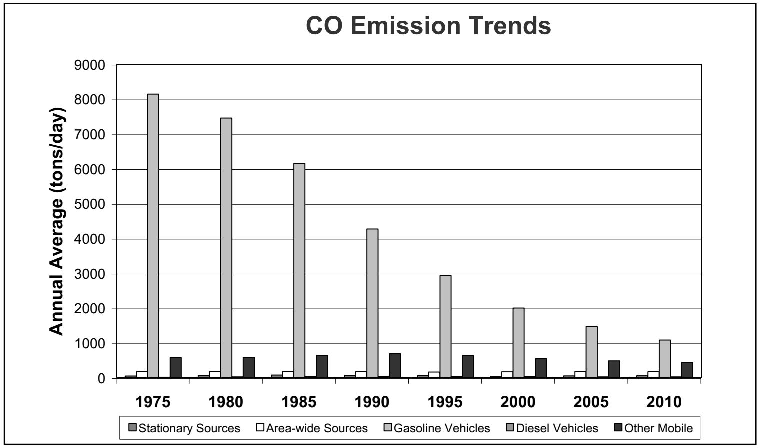

Figure 4-21

San Francisco Bay Area Air Basin
Carbon Monoxide Air Quality Trend

As in other areas of the State, carbon monoxide concentrations in the San Francisco Bay Area Air Basin have declined substantially over the last 20 years. The peak 8-hour indicator value during 2002 was about half of what it was during 1983 and is now well below the level of the standards. In fact, neither the State nor the national standards have been exceeded in this area since 1991.

Much of the decline in ambient carbon monoxide concentrations can be attributed to the introduction of clean fuels and newer, cleaner motor vehicles. The San Francisco Bay Area Air Basin is currently designated as attainment for both the State and national CO standards. Based on emission projections, the area is expected to maintain its attainment status in the coming years.

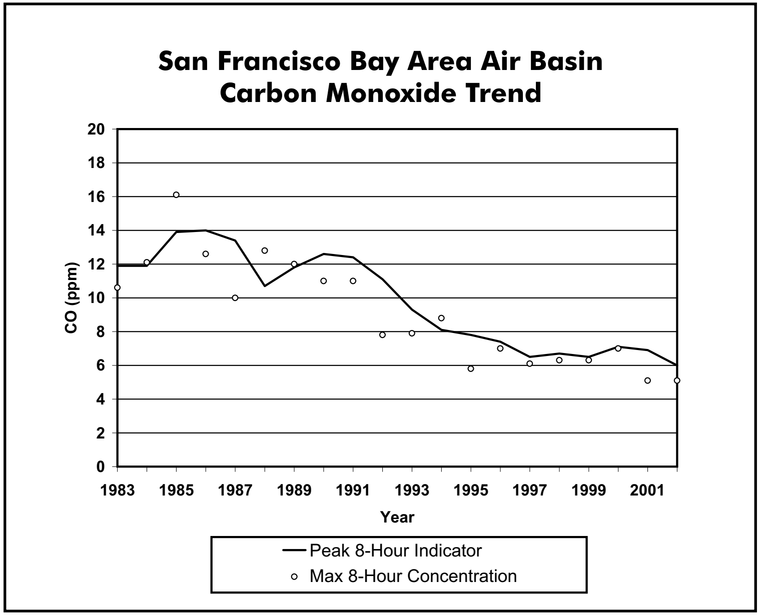

Figure 4-22

San Francisco Bay Area Air Basin

Carbon Monoxide Air Quality Table

CARBON MONOXIDE (ppm)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Peak 8-Hr. Indicator	11.9	11.9	13.9	14.0	13.4	10.7	11.8	12.6	12.4	11.1	9.3	8.1	7.8	7.4	6.5	6.7	6.5	7.1	6.9	6.0
Max. 1-Hr. Concentration	17.0	20.0	21.0	20.0	17.0	15.0	19.0	18.0	15.0	12.0	14.0	12.0	10.1	8.8	10.7	8.7	9.0	9.8	7.6	7.7
Max. 8-Hr. Concentration	10.6	12.1	16.1	12.6	10.0	12.8	12.0	11.0	11.0	7.8	7.9	8.8	5.8	7.0	6.1	6.3	6.3	7.0	5.1	5.1
Days Above State 8-Hr. Std.	4	8	24	8	2	4	10	4	5	0	0	0	0	0	0	0	0	0	0	0
Days Above Nat. 8-Hr. Std.	4	7	21	8	1	4	9	2	4	0	0	0	0	0	0	0	0	0	0	0

Table 4-18

San Joaquin Valley Air Basin

Introduction - Area Description

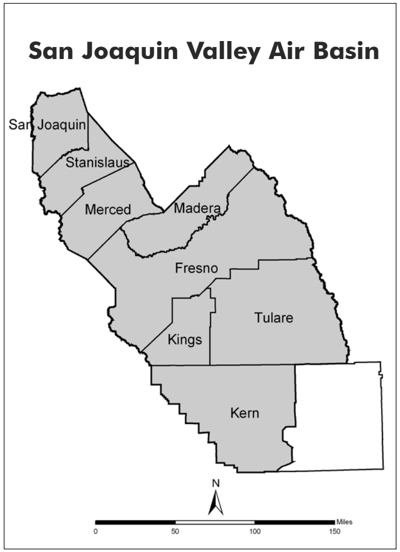

Figure 4-23

The San Joaquin Valley Air Basin occupies the southern two-thirds of California's Central Valley. The eight-county area comprises Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare counties and the western portion of Kern County. The Valley covers nearly 23,490 square miles. With very few exceptions, the San Joaquin Valley is flat and unbroken, with most of the area lying below 400 feet in elevation. The Valley floor slopes downward from east to west, and the San Joaquin River winds its way along the western side from south to north.

Similar to other inland areas, the San Joaquin Valley has cool wet winters and hot dry summers. Generally, the temperature increases and rainfall decreases from north to south.

In contrast to other California areas, air quality in the San Joaquin Valley is not dominated by emissions from one large urban area. Instead, there are a number of moderately sized urban areas spread along the main axis of the Valley. This wide distribution of emissions complicates the challenge faced by air quality control agencies. Overall, about 10 percent of California's population lives in the San Joaquin Valley, and pollution sources in the region account for about 14 percent of the total statewide criteria pollutant emissions.

San Joaquin Valley Air Basin

Emission Trends and Forecasts

Overall, the emission levels in the San Joaquin Valley Air Basin have been decreasing since 1990. The decreases are predominantly due to motor vehicle controls and reductions in evaporative and fugitive emissions. On-road motor vehicles are the largest contributors to CO emissions in the San Joaquin Valley. On-road motor vehicles, other mobile sources, and stationary sources are all significant contributors to NO_x emissions. A significant portion of the stationary source ROG emissions is fugitive emissions from the extensive oil and gas production operations in the lower San Joaquin Valley. PM_{10} emissions are mostly fugitive dust from paved and unpaved roads, agricultural operations, and waste burning.

San Joaquin Valley Air Basin
Population and VMT

Compared to California's other urban areas, the population and number of vehicle miles traveled each day in the San Joaquin Valley Air Basin is projected to grow at a much faster rate during the 1980 to 2010 time period. The population is projected to increase about 107 percent, from nearly 2 million in 1980 to nearly 4.1 million in 2010. During the same period, the daily VMT is projected to increase by 227 percent, from nearly 33 million miles per day in 1980 to over 107 million miles per day in 2010. These growth rates are so much higher than the growth rates in other areas.

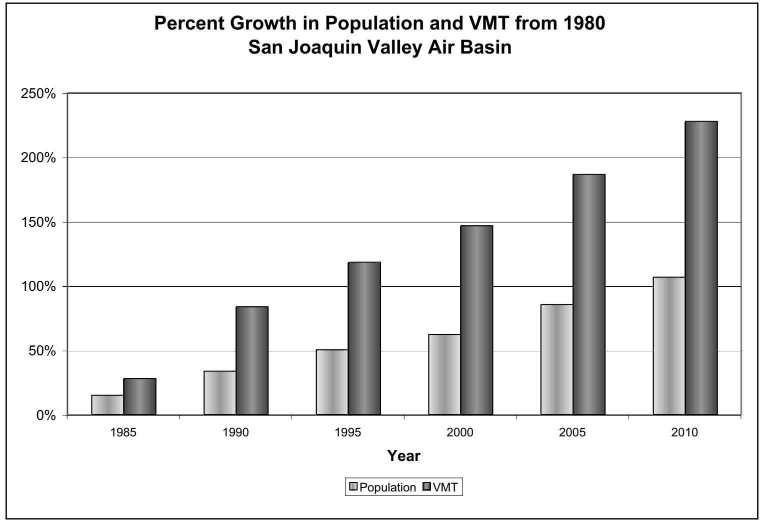

Figure 4-24

San Joaquin Valley Air Basin

Ozone Precursor Emission Trends and Forecasts

Emissions of the ozone precursors NO_x and ROG are decreasing in the San Joaquin Valley Air Basin. Both stationary source and motor vehicle NO_x emissions have been reduced by the adoption of more stringent emission standards. Stricter standards have reduced ROG emissions from motor vehicles since 1980, even though vehicle miles traveled (VMT) have been increasing. Stationary and area-wide sources of ROG include petroleum production operations and the use of solvents. Stricter emission standards and new controls have reduced the ROG emissions from these sources. Also, declining crude oil prices have resulted in cutbacks in oil production activities and an attendant decrease in ROG fugitive emissions. Future increases in oil prices could result in higher levels of production, which could again increase emissions.

NO_x Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***672***	***835***	***836***	***806***	***682***	***570***	***477***	***403***
Stationary Sources	263	350	348	285	216	165	139	140
Area-wide Sources	13	13	13	12	12	11	11	11
On-Road Mobile	219	252	292	320	288	239	196	145
Gasoline Vehicles	169	171	168	174	161	121	83	58
Diesel Vehicles	50	81	124	145	127	118	113	87
Other Mobile	177	220	182	190	166	155	131	107

Table 4-19

ROG Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***1166***	***1227***	***1052***	***637***	***500***	***429***	***379***	***357***
Stationary Sources	690	740	578	197	103	93	89	92
Area-wide Sources	134	140	149	153	160	157	160	167
On-Road Mobile	292	286	268	224	174	119	84	59
Gasoline Vehicles	289	281	260	216	168	114	79	55
Diesel Vehicles	3	5	8	8	6	5	5	5
Other Mobile	50	61	58	64	64	60	46	39

Table 4-20

San Joaquin Valley Air Basin
Ozone Precursor Emission Trends and Forecasts

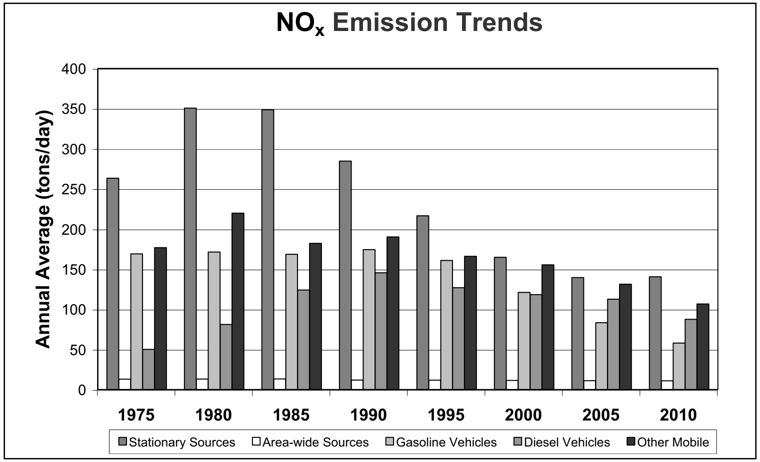

Figure 4-25

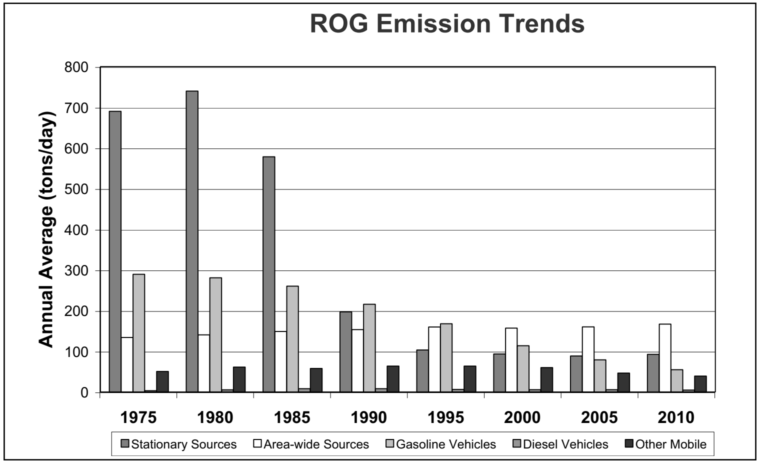

Figure 4-26

San Joaquin Valley Air Basin

Ozone Air Quality Trend

The ozone problem in the San Joaquin Valley ranks among the most severe in the State. From 1983 to 2003, the maximum peak 1-hour indicator decreased only 18 percent. The number of national 1-hour standard exceedance days has been quite variable over the years. This variability is due, in part, to the influence of meteorology as well as changes to the monitoring network. The monitoring network was not as extensive during the 1980's as it has been during the last 13 years. For this reason, the period between 1990 to 2003 provides a better indication of trends. During this period, there has been an 18 percent decrease in the number of exceedance days of the national 1-hour standard and a 5 percent increase in the number of exceedance days for the State 1-hour standard.

The ARB has identified the San Joaquin Valley Air Basin as both a contributor and a receptor for ozone transport. The Valley is a transport contributor to the Sacramento region, the Great Basin Valleys Air Basin, the Mountain Counties Air Basin, the Mojave Desert Air Basin, the North Central Coast Air Basin, and the South Central Coast Air Basin. In contrast, the San Joaquin Valley Air Basin is a receptor area for ozone transported from the Broader Sacramento Area and the San Francisco Bay Area Air Basin.

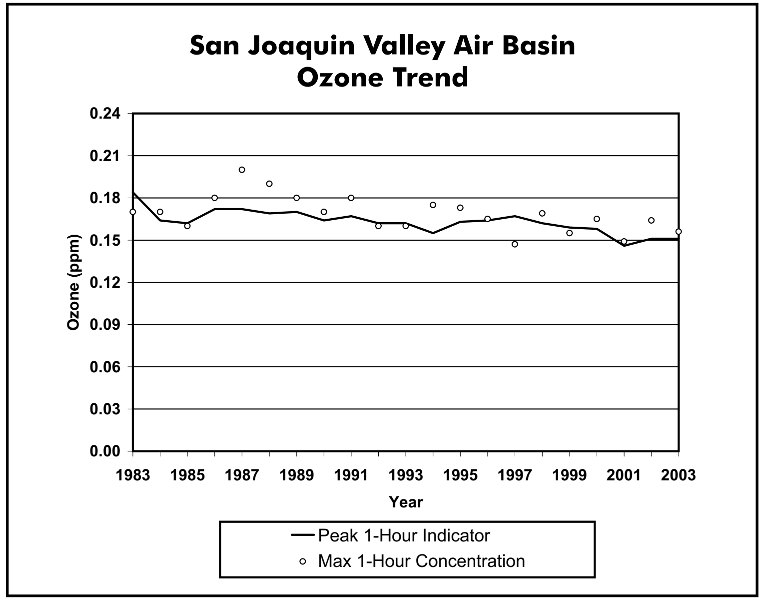

Figure 4-27

San Joaquin Valley Air Basin
Ozone Air Quality Table

OZONE (ppm)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Peak 1-Hour Indicator	0.184	0.164	0.162	0.172	0.172	0.169	0.170	0.164	0.167	0.162	0.162	0.155	0.163	0.164	0.167	0.162	0.159	0.158	0.146	0.151	0.151
4th High 1-Hr in 3 Yrs	0.170	0.160	0.160	0.170	0.170	0.170	0.170	0.160	0.160	0.160	0.160	0.160	0.165	0.165	0.164	0.161	0.161	0.161	0.146	0.151	0.151
Avg of 4th Hi 8-Hr in 3 Yrs	0.116	0.114	0.111	0.117	0.118	0.121	0.120	0.119	0.118	0.115	0.112	0.111	0.119	0.119	0.115	0.115	0.113	0.111	0.109	0.115	0.115
Maximum 1-Hr. Concentration	0.170	0.170	0.160	0.180	0.200	0.190	0.180	0.170	0.180	0.160	0.160	0.175	0.173	0.165	0.147	0.169	0.155	0.165	0.149	0.164	0.156
Max. 8-Hr. Concentration	0.122	0.136	0.131	0.135	0.150	0.127	0.136	0.123	0.130	0.121	0.125	0.129	0.134	0.137	0.127	0.136	0.123	0.131	0.120	0.132	0.127
Days Above State Standard	105	135	149	147	156	156	148	131	133	127	125	118	124	120	110	90	123	114	123	127	137
Days Above Nat. 1-Hr. Std.	41	61	53	59	65	74	54	45	51	29	43	43	44	56	16	39	28	30	32	31	37
Days Above Nat. 8-Hr. Std.	100	120	127	134	148	140	133	104	121	119	104	108	109	114	95	84	117	103	109	125	134

Table 4-21

San Joaquin Valley Air Basin

Directly Emitted PM_{10} Emission Trends and Forecasts

Direct emissions of PM_{10} are increasing between 1975 and 2010. PM_{10} emissions in the San Joaquin Valley are dominated by emissions from area-wide sources, primarily fugitive dust from vehicle travel on unpaved and paved roads, waste burning, and residential fuel combustion (including wood).

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NOx, SOx, ROG, and ammonia (secondary PM). The PM_{10} emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted PM_{10} emissions contribute approximately 75 percent of the ambient PM_{10} in the San Joaquin Valley Air Basin.

Directly Emitted PM10 Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***341***	***331***	***331***	***338***	***331***	***332***	***343***	***358***
Stationary Sources	58	42	34	28	27	22	24	25
Area-wide Sources	267	268	278	289	288	294	304	319
On-Road Mobile	4	6	8	9	7	6	6	6
Gasoline Vehicles	2	2	2	2	3	3	4	4
Diesel Vehicles	2	4	6	6	4	3	3	2
Other Mobile	12	15	12	13	10	10	9	8

Table 4-22

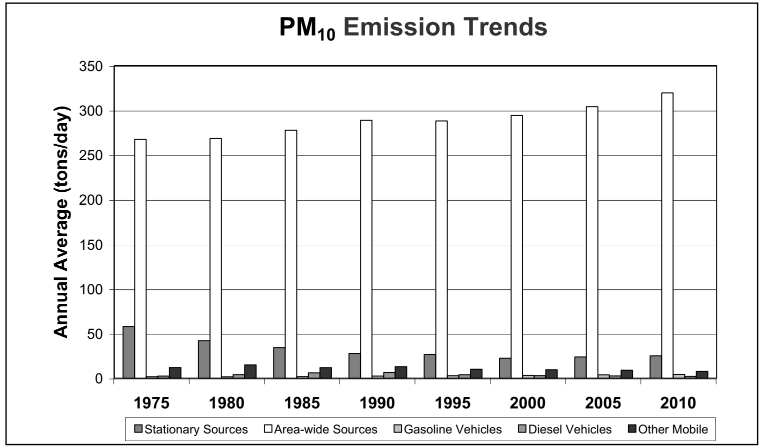

Figure 4-28

San Joaquin Valley Air Basin

Directly Emitted $PM_{2.5}$ Emission Trends and Forecasts

Direct emissions of $PM_{2.5}$ increase from 1975 to 2010. $PM_{2.5}$ emissions in the San Joaquin Valley are dominated by emissions from area-wide sources, primarily fugitive dust from vehicle travel on unpaved and paved roads, waste burning, and residential fuel combustion (including wood).

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NO_x, SO_x, ROG, and ammonia (secondary PM). The $PM_{2.5}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{2.5}$ emissions contribute approximately 60 percent of the ambient $PM_{2.5}$ in the San Joaquin Valley Air Basin.

Directly Emitted $PM_{2.5}$ Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***161***	***153***	***148***	***147***	***142***	***141***	***144***	***148***
Stationary Sources	47	32	24	18	18	16	17	18
Area-wide Sources	100	103	106	109	110	112	115	119
On-Road Mobile	3	5	6	7	5	4	4	4
Gasoline Vehicles	1	1	1	1	2	2	2	2
Diesel Vehicles	2	4	6	6	4	3	2	2
Other Mobile	11	14	11	12	9	9	8	7

Table 4-23

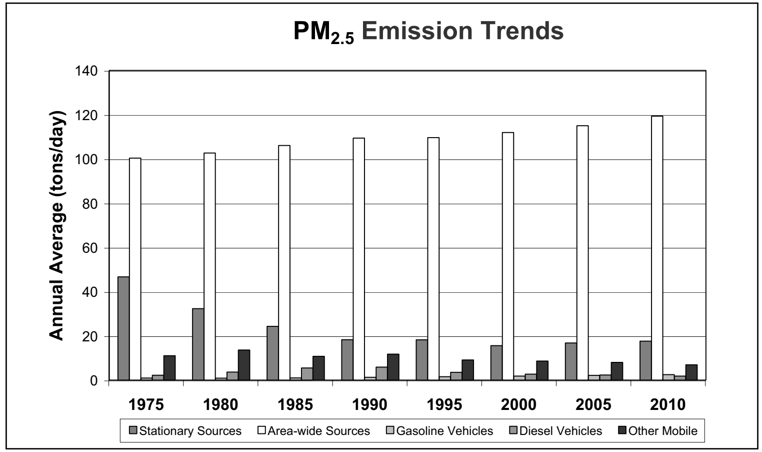

Figure 4-29

San Joaquin Valley Air Basin
PM_{10} Air Quality Trend

The available PM_{10} data show some variation during the trend period, but overall, there has been a downward trend. Part of the variation can be attributed to meteorology. Long periods of stagnation during the winter months allow PM_{10} to accumulate over many days with resulting high concentrations. The low values for the maximum annual average of quarters in 1988 and 1989 are due to the limited number of monitors with complete data for these years during the startup of the PM_{10} monitoring network. The period between 1990 and 2002 provides a better indication of trends. Over this period, the maximum annual average of quarters (state) shows a decrease of about 25 percent. The calculated number of days exceeding the State and national 24-hour standards also shows a decrease. There were 300 calculated State standard exceedance days and 40 calculated national standard exceedance days during 1988. During 2002, there were 267 calculated State standard exceedance days and 8 national standard exceedance days. Although PM_{10} air quality has improved overall in the San Joaquin Valley Air Basin, values for 1999 through 2002 were higher than those for 1998. We will need several more years of data before we can determine whether this trend is a result of meteorology or a change in emissions. However, based on the ambient data, it will still be a number of years before this area reaches attainment.

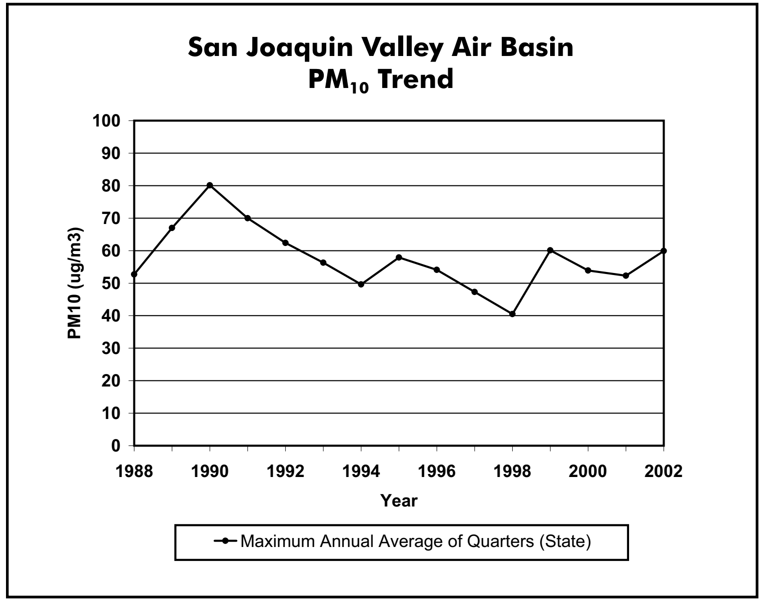

Figure 4-30

San Joaquin Valley Air Basin

PM_{10} Air Quality Table

PM_{10} (ug/m3)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Max. 24-Hour Concentration (State)						206	237	439	279	186	239	192	279	153	199	167	186	153	221	194
Max. 24-Hr. Concentration (Nat)						244	250	439	279	183	239	190	279	153	199	160	183	145	205	189
Max. Annual Avg of Qrtrs (State)						52.7	67.0	80.1	70.0	62.4	56.3	49.6	57.9	54.1	47.3	40.5	60.1	53.9	52.3	59.9
Max. Annual Avg of Qrtrs (Nat)						67.4	79.3	79.3	69.9	62.9	56.3	50.1	58.2	54.1	48.2	39.9	59.5	53.1	57.4	59.2
Calc Days Above State 24-Hr Std						300	302	313	285	273	233	253	246	225	188	185	216	237	236	267
Calc Days Above Nat 24-Hr Std						40	40	56	40	3	11	8	8	0	3	6	12	0	12	8

Table 4-24

San Joaquin Valley Air Basin
Carbon Monoxide Emission Trends and Forecasts

Emissions of CO are trending downward between 1975 and 2010. Motor vehicles are by far the largest source of CO emissions. Emissions from motor vehicles have been declining since 1975, despite increases in vehicle miles traveled (VMT), with the introduction of new automotive emission controls and fleet turnover.

CO Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***3851***	***3878***	***3657***	***3335***	***2616***	***2070***	***1670***	***1384***
Stationary Sources	197	168	73	77	64	52	54	55
Area-wide Sources	408	408	409	406	397	394	392	391
On-Road Mobile	2895	2869	2784	2428	1751	1252	874	606
Gasoline Vehicles	2883	2848	2750	2391	1721	1227	851	585
Diesel Vehicles	12	21	34	37	30	25	24	21
Other Mobile	352	433	391	425	404	372	349	332

Table 4-25

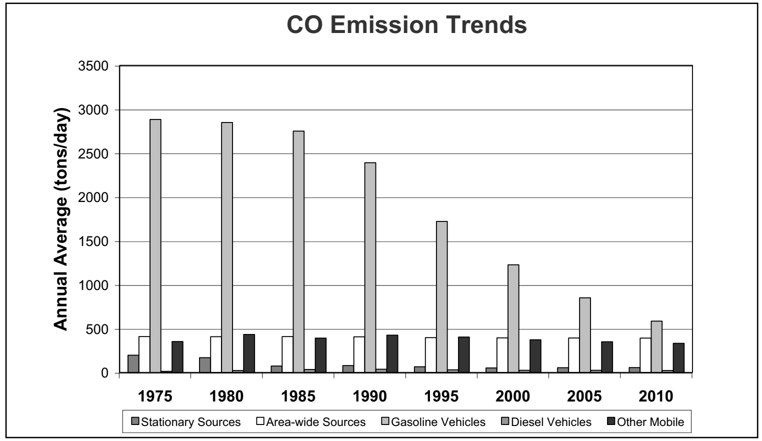

Figure 4-31

San Joaquin Valley Air Basin

Carbon Monoxide Air Quality Trend

Carbon monoxide concentrations show a fairly consistent downward trend from 1983 through 2002. Similar to other areas of the State, the trend line for the San Joaquin Valley Air Basin shows a slight increase during the late 1980s, probably related to meteorology. The maximum peak 8-hour indicator for 2002 is less than half that for 1983. Measured concentrations in the San Joaquin Valley Air Basin have not exceeded the national CO standards since 1991, and concentrations have not exceeded the State standards for the last seven years. Much of the decline in ambient CO concentrations can be attributed to the introduction of clean fuels and newer, cleaner motor vehicles.

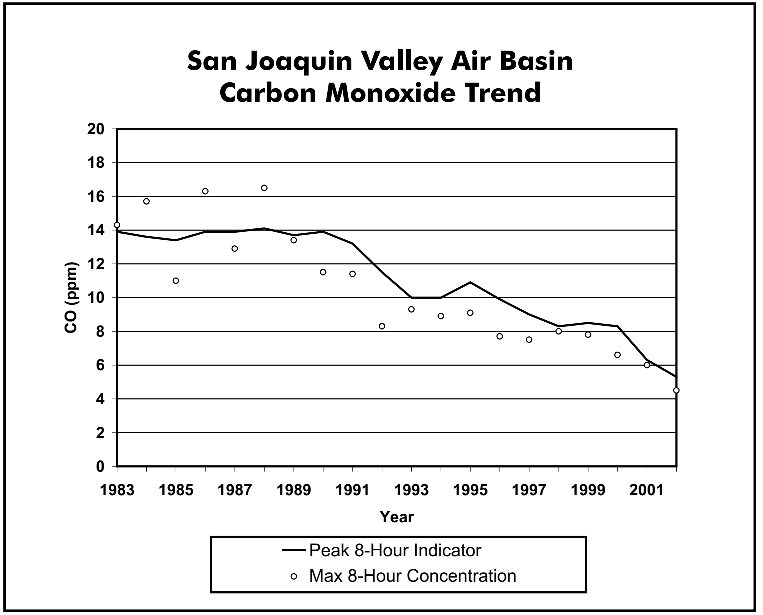

Figure 4-32

San Joaquin Valley Air Basin

Carbon Monoxide Air Quality Table

CARBON MONOXIDE (ppm)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Peak 8-Hr. Indicator	13.9	13.6	13.4	13.9	13.9	14.1	13.7	13.9	13.2	11.5	10.0	10.0	10.9	9.9	9.0	8.3	8.5	8.3	6.3	5.3
Max. 1-Hr. Concentration	17.0	24.0	18.0	21.0	16.0	19.0	23.0	17.0	19.0	13.0	13.0	15.0	12.0	11.0	9.9	10.3	11.9	10.1	16.0	6.1
Max. 8-Hr. Concentration	14.3	15.7	11.0	16.3	12.9	16.5	13.4	11.5	11.4	8.3	9.3	8.9	9.1	7.7	7.5	8.0	7.8	6.6	6.0	4.5
Days Above State 8-Hr. Std.	12	7	7	13	4	5	24	10	3	0	2	0	1	0	0	0	0	0	0	0
Days Above Nat. 8-Hr. Std.	9	6	7	11	4	6	18	9	3	0	0	0	0	0	0	0	0	0	0	0

Table 4-26

San Diego Air Basin

Introduction - Area Description

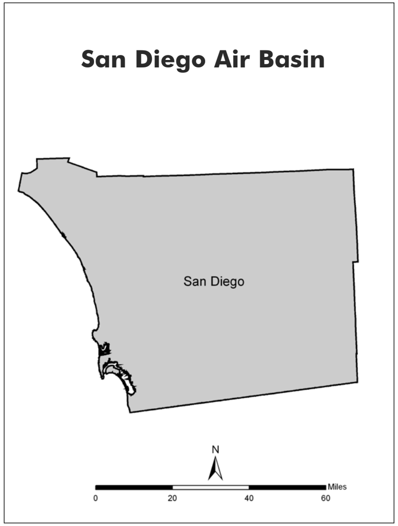

Figure 4-33

The San Diego Air Basin lies in the southwest corner of California and comprises all of San Diego County. However, the population and emissions are concentrated mainly in the western portion of the County. The air basin covers 4,200 square miles, includes about 8 percent of the State's population, and produces about 7 percent of the State's criteria pollutant emissions. Because of its southerly location and proximity to the ocean, much of the San Diego Air Basin has a relatively mild climate.

Air quality in the San Diego Air Basin is impacted not only by local emissions, but also by pollutants transported from other areas -- in particular, ozone and ozone precursor emissions transported from the South Coast Air Basin and Mexico. Although the impact of transport is particularly important on days with high ozone concentrations, transported pollutants and emissions cannot be blamed entirely for the ozone problem in the San Diego area. Studies show that emissions from the San Diego Air Basin are sufficient, on their own, to cause ozone violations.

San Diego Air Basin

Emission Trends and Forecasts

Emissions of NO_x, ROG, PM_{10}, and CO in the San Diego Air Basin have been following the statewide trends since 1975. These trends are largely due to motor vehicle controls and reductions in evaporative emissions. Mobile sources (both on-road and other) are by far the largest contributors to NO_x, ROG, and CO emissions in the San Diego Air Basin. The majority of the PM_{10} emissions are from area-wide sources.

San Diego Air Basin
Population and VMT

Population in the San Diego Air Basin during the 1980-2010 period is projected to increase 80 percent: from almost 1.9 million in 1980 to almost 3.4 million in 2010. During this same time period, the number of vehicle miles traveled each day is projected to increase over 175 percent, from almost 32 million miles per day in 1980 to over 87 million miles per day in 2010. As in other parts of California, overall air quality in the San Diego Air Basin has improved, despite high growth rates, indicating the benefits of cleaner technologies.

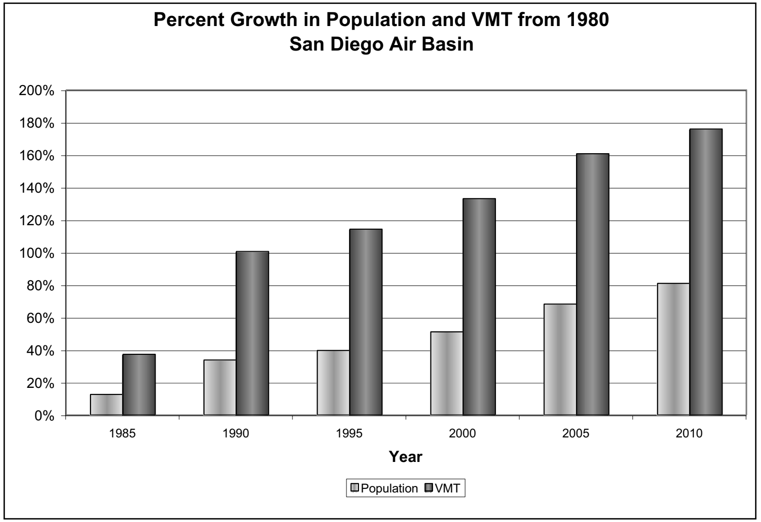

Figure 4-34

San Diego Air Basin
Ozone Precursor Emission Trends and Forecasts

Emissions of the ozone precursor NO_x increase between 1975 and 1990 and decrease thereafter. ROG emissions have been decreasing overall since 1975. These decreases are mostly due to decreased emissions from motor vehicles, brought about by stricter motor vehicle emission standards. Stationary and area-wide source emissions of ROG have remained mostly unchanged over the last 20 years, with stricter emission standards offsetting industrial and population growth.

NO_x Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***282***	***274***	***286***	***319***	***272***	***227***	***188***	***153***
Stationary Sources	48	32	17	19	16	10	10	12
Area-wide Sources	3	3	3	3	3	3	3	3
On-Road Mobile	178	174	195	216	185	149	113	83
Gasoline Vehicles	168	155	156	157	133	96	62	43
Diesel Vehicles	10	19	39	59	52	52	51	40
Other Mobile	54	67	71	81	68	66	62	55

Table 4-27

ROG Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***444***	***442***	***419***	***348***	***270***	***227***	***188***	***175***
Stationary Sources	40	57	55	53	45	49	56	64
Area-wide Sources	36	41	45	47	42	42	40	42
On-Road Mobile	338	306	274	196	133	89	60	43
Gasoline Vehicles	337	305	271	193	130	86	58	41
Diesel Vehicles	1	1	3	3	3	2	2	2
Other Mobile	31	38	45	51	50	46	33	27

Table 4-28

San Diego Air Basin
Ozone Precursor Emission Trends and Forecasts

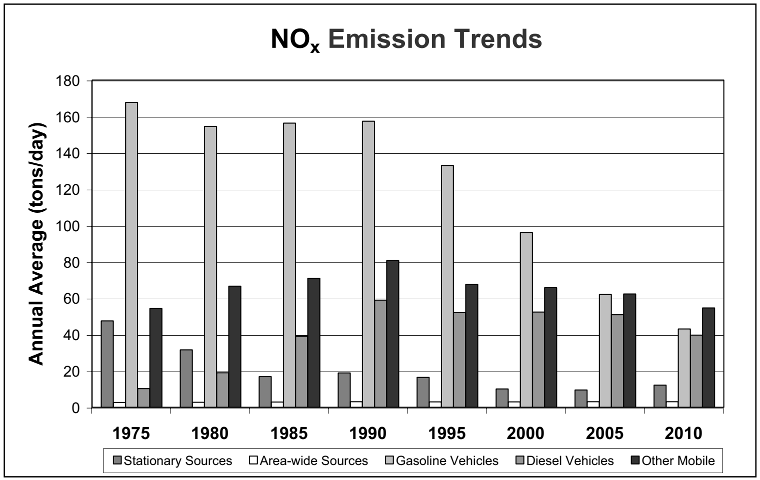

Figure 4-35

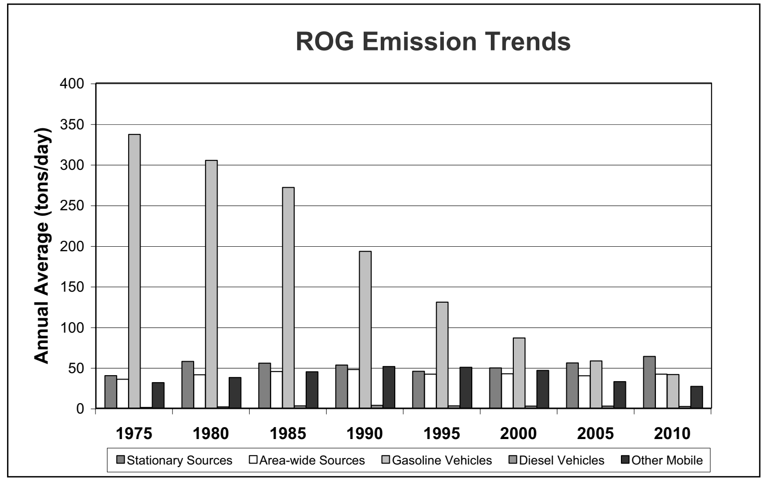

Figure 4-36

San Diego Air Basin

Ozone Air Quality Trend

Both the peak indicator and the number of days above the State and national ozone standards have decreased over the last 20 years. The peak 1-hour ozone indicator shows an overall decline of almost 38 percent from 1983 to 2003. The number of State and national 1-hour standard exceedance days has dropped even more. There were 125 State standard exceedance days during 1983 compared with 23 during 2003. This represents a decrease of about 82 percent. During 1983, there were 61 national 1-hour standard exceedance days compared with one during 2003. However, there were still six national 8-hour standard exceedance days during 2003.

The San Diego Air Basin is the only one of the five major air basins the ARB has not identified as a transport contributor to a downwind area. The San Diego area is, however, a transport receptor. While it is clear that additional local emission controls will be needed to reach attainment of the ozone standards in the San Diego area, because of transport, future air quality in this area will also be affected by emission controls and growth in the South Coast Air Basin and, to some extent, Mexico.

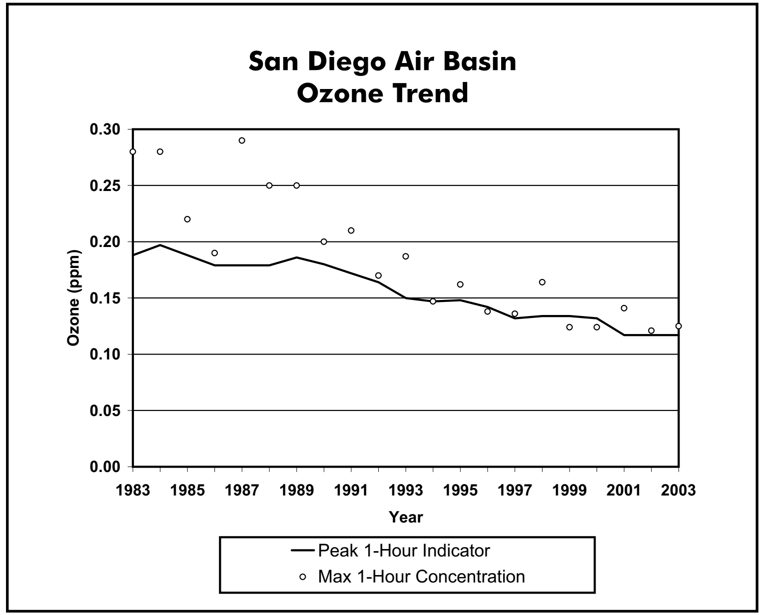

Figure 4-37

San Diego Air Basin

Ozone Air Quality Table

OZONE (ppm)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Peak 1-Hour Indicator	0.188	0.197	0.188	0.179	0.179	0.179	0.186	0.180	0.172	0.164	0.150	0.147	0.148	0.142	0.132	0.134	0.134	0.132	0.117	0.117	0.117
4th High 1-Hr in 3 Yrs	0.200	0.200	0.210	0.190	0.180	0.180	0.190	0.190	0.170	0.170	0.154	0.150	0.146	0.141	0.138	0.135	0.135	0.131	0.118	0.118	0.118
Avg of 4th Hi 8-Hr in 3 Yrs	0.130	0.126	0.132	0.125	0.124	0.121	0.125	0.129	0.125	0.118	0.112	0.109	0.108	0.104	0.099	0.102	0.099	0.100	0.094	0.095	0.093
Maximum 1-Hr. Concentration	0.280	0.280	0.220	0.190	0.290	0.250	0.250	0.200	0.210	0.170	0.187	0.147	0.162	0.138	0.136	0.164	0.124	0.124	0.141	0.121	0.125
Max. 8-Hr. Concentration	0.176	0.207	0.168	0.143	0.196	0.156	0.193	0.145	0.145	0.133	0.154	0.121	0.122	0.117	0.112	0.141	0.100	0.106	0.116	0.100	0.103
Days Above State Standard	125	146	148	131	127	160	159	139	106	97	90	79	96	51	43	54	27	24	29	15	23
Days Above Nat. 1-Hr. Std.	61	51	50	42	40	45	56	39	27	19	14	9	12	2	1	9	0	0	2	0	1
Days Above Nat. 8-Hr. Std.	101	98	109	81	99	119	122	96	67	66	58	46	48	31	16	35	16	16	17	13	6

Table 4-29

San Diego Air Basin

Directly Emitted PM_{10} Emission Trends and Forecasts

Direct emissions of PM_{10} almost double in the San Diego Air Basin between 1975 and 2010. This increase is due to growth in emissions from area-wide sources, primarily fugitive dust from vehicle travel on unpaved and paved roads, dust from construction and demolition operations, and particulates from residential fuel combustion (including wood). The growth in these area-wide sources is primarily due to population growth and increases in vehicle miles traveled (VMT).

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NOx, SOx, ROG, and ammonia (secondary PM). The PM_{10} emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted PM_{10} emissions contribute approximately 70 percent of the ambient PM_{10} in the San Diego Air Basin.

Directly Emitted PM10 Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***73***	***81***	***90***	***108***	***104***	***112***	***118***	***126***
Stationary Sources	17	12	5	7	10	8	8	11
Area-wide Sources	47	60	73	88	84	92	99	104
On-Road Mobile	3	3	4	5	4	4	5	5
Gasoline Vehicles	2	2	2	2	3	3	3	4
Diesel Vehicles	1	1	2	3	2	1	1	1
Other Mobile	6	7	7	8	7	7	7	6

Table 4-30

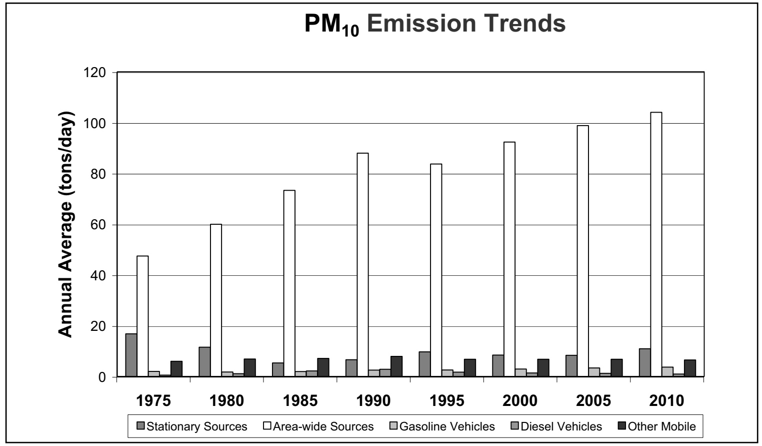

Figure 4-38

San Diego Air Basin
Directly Emitted $PM_{2.5}$ Emission Trends and Forecasts

Direct emissions of $PM_{2.5}$ increase steadily in the San Diego Air Basin between 1975 and 2010. This increase is due to growth in emissions from area-wide sources, primarily fugitive dust from vehicle travel on unpaved and paved roads, dust from construction and demolition operations, and particulates from residential fuel combustion (including wood). The growth in these area-wide sources is primarily due to population growth and increases in vehicle miles traveled (VMT).

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NOx, SOx, ROG, and ammonia (secondary PM). The $PM_{2.5}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{2.5}$ emissions contribute approximately 50 percent of the ambient $PM_{2.5}$ in the San Diego Air Basin.

Directly Emitted $PM_{2.5}$ Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***34***	***36***	***35***	***40***	***39***	***41***	***43***	***46***
Stationary Sources	11	9	3	4	6	6	6	8
Area-wide Sources	15	19	22	25	24	26	27	28
On-Road Mobile	2	2	3	4	3	3	3	3
Gasoline Vehicles	1	1	1	1	1	2	2	2
Diesel Vehicles	0	1	2	3	2	1	1	1
Other Mobile	6	6	7	7	6	6	6	6

Table 4-31

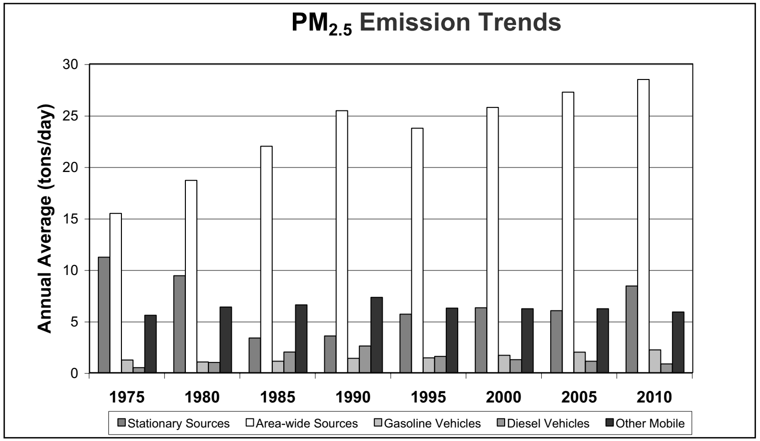

Figure 4-39

San Diego Air Basin

PM_{10} Air Quality Trend

PM_{10} concentrations in the San Diego Air Basin have changed little during the years for which reliable data are available. The maximum annual average of quarters for 2002 exceeds the State annual standard and is actually higher than it was during 1989. This apparent lack of progress is a result of monitoring that began at a new site, with higher concentrations, during 1993. The maximum 24-hour concentration also exceeds the State standard. During 2002, the maximum 24-hour concentration (state) was 131 $\mu g/m^3$.

During 1988, there were 105 calculated State standard exceedance days, compared with 186 during 2002. Again, some of this apparent increase is attributable to the new site that began operating in 1993. There is a substantial amount of variability from year-to-year in the 24-hour statistics. This variability is a reflection of meteorology, the 1-in-6-day sampling schedule, and changes in monitoring location. Although ambient PM_{10} concentrations in the San Diego Air Basin are not as high as in some other areas of the State, additional emission controls will be needed to bring this area into attainment.

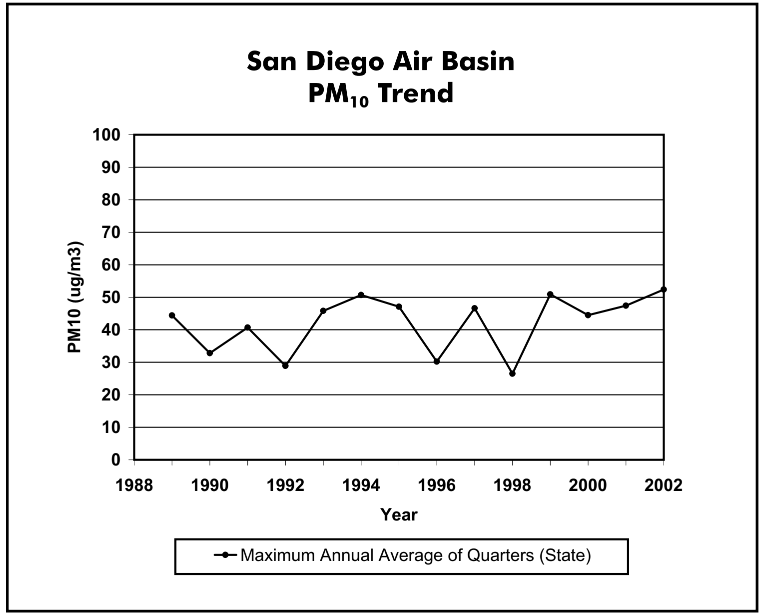

Figure 4-40

San Diego Air Basin

PM_{10} Air Quality Table

PM_{10} (ug/m3)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Max. 24-Hour Concentration (State)						80	90	115	81	67	159	129	121	93	125	57	119	136	106	131
Max. 24-Hr. Concentration (Nat)						81	90	115	81	67	159	129	121	93	125	89	121	139	107	130
Max. Annual Avg of Qrtrs (State)							44.4	32.8	40.7	28.9	45.8	50.7	47.1	30.2	46.6	26.5	50.9	44.5	47.4	52.4
Max. Annual Avg of Qrtrs (Nat)						40.0	43.8	37.6	40.6	35.9	45.9	50.7	46.8	30.0	46.6	42.5	52.2	45.2	49.1	54.9
Calc Days Above State 24-Hr Std						105	146	60	90	42	143.5	131	117	96	125	108	140	144	146	186
Calc Days Above Nat 24-Hr Std						0	0	0	0	0	6	0	0	0	0	0	0	0	0	0

Table 4-32

San Diego Air Basin
Carbon Monoxide Emission Trends and Forecasts

CO emissions in the San Diego Air Basin mirror the decreasing statewide trend from 1975 to 2010, even though the motor vehicle miles traveled (VMT) are increasing. This is yet another example of how California's motor vehicle control program is having a positive impact on CO emissions.

CO Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***3332***	***3068***	***2965***	***2501***	***1756***	***1317***	***986***	***801***
Stationary Sources	30	29	28	28	26	39	34	51
Area-wide Sources	56	62	68	72	64	66	68	70
On-Road Mobile	3059	2740	2586	2067	1360	930	626	438
Gasoline Vehicles	3056	2735	2575	2052	1347	918	616	429
Diesel Vehicles	3	6	11	15	13	11	11	9
Other Mobile	188	236	282	334	306	282	257	243

Table 4-33

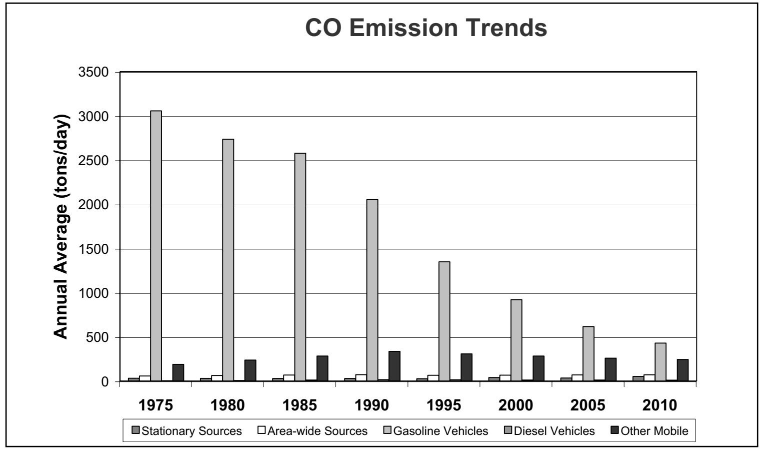

Figure 4-41

San Diego Air Basin
Carbon Monoxide Air Quality Trend

Peak 8-hour indicator for carbon monoxide in the San Diego Air Basin decreased substantially over the trend period: a 43 percent decrease from 1983 to 2002. As a result of these decreases, the national CO standards have not been exceeded in the San Diego Air Basin since 1989. The last exceedance of the State standards occurred during 1990.

With existing and anticipated motor vehicle and clean fuels regulations, ambient CO concentrations should continue to decline. This should be sufficient to maintain a healthful level of carbon monoxide in this area.

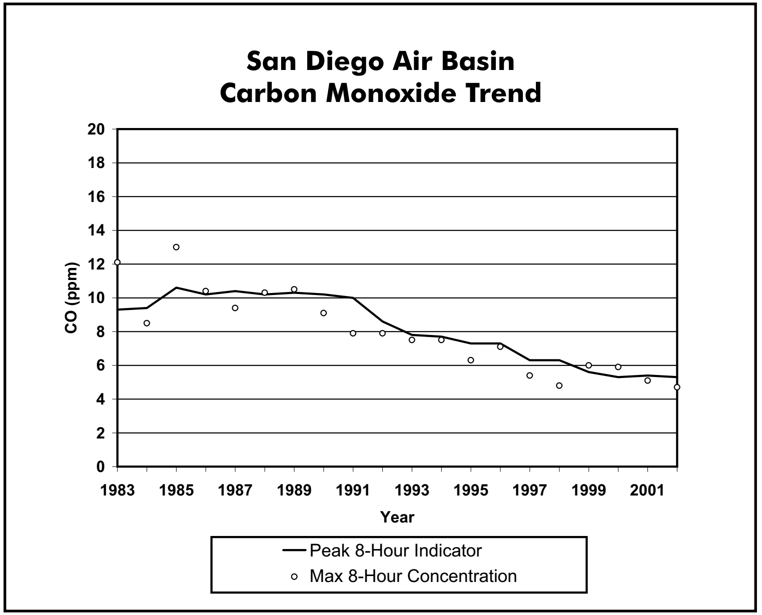

Figure 4-42

San Diego Air Basin

Carbon Monoxide Air Quality Table

CARBON MONOXIDE (ppm)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Peak 8-Hr. Indicator	9.3	9.4	10.6	10.2	10.4	10.2	10.3	10.2	10.0	8.6	7.8	7.7	7.3	7.3	6.3	6.3	5.6	5.3	5.4	5.3
Max. 1-Hr. Concentration	16.0	16.0	17.0	16.0	14.0	17.0	17.0	18.0	14.0	14.0	11.4	11.0	9.9	12.4	9.3	10.2	9.9	9.3	8.5	8.5
Max. 8-Hr. Concentration	12.1	8.5	13.0	10.4	9.4	10.3	10.5	9.1	7.9	7.9	7.5	7.5	6.3	7.1	5.4	4.8	6.0	5.9	5.1	4.7
Days Above State 8-Hr. Std.	1	0	5	2	1	5	6	1	0	0	0	0	0	0	0	0	0	0	0	0
Days Above Nat. 8-Hr. Std.	1	0	3	1	0	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4-34

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San Diego Air Basin
Oxides of Nitrogen Emission Trends and Forecasts

NO_x (and nitrogen dioxide) emissions in the San Diego Air Basin follow the declining statewide trend from 1990 to 2010. The continued adoption of more stringent motor vehicle and stationary source emission standards should continue to reduce nitrogen dioxide emissions.

NO_x Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***282***	***274***	***286***	***319***	***272***	***227***	***188***	***153***
Stationary Sources	48	32	17	19	16	10	10	12
Area-wide Sources	3	3	3	3	3	3	3	3
On-Road Mobile	178	174	195	216	185	149	113	83
Gasoline Vehicles	168	155	156	157	133	96	62	43
Diesel Vehicles	10	19	39	59	52	52	51	40
Other Mobile	54	67	71	81	68	66	62	55

Table 4-35

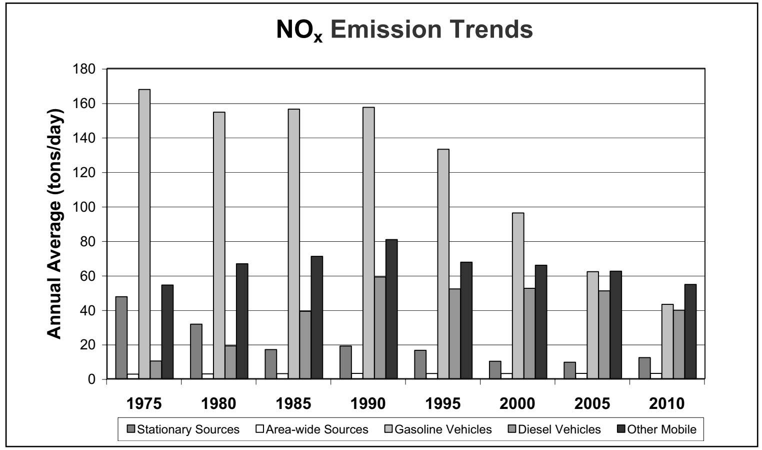

Figure 4-43

San Diego Air Basin

Nitrogen Dioxide Air Quality Trend

The San Diego Air Basin attains the State and national nitrogen dioxide standard. Maximum 1-hour concentrations during the 1980s occasionally exceeded the level of the State 1-hour standard. However, these exceedances did not affect the area's attainment status. Ambient concentrations are now well below the levels of both the State and national standards. Data show that the maximum peak 1-hour indicator decreased 46 percent from 1983 to 2002.

Because oxides of nitrogen (NO_x) emissions contribute to ozone, as well as to nitrogen dioxide, many of the ozone control measures help reduce ambient NO_2 concentrations. Furthermore, NO_x emission controls are a critical part of the ozone control strategy and are not expected to be relaxed in the future. As a result, these controls should ensure continued attainment of the State and national nitrogen dioxide standards.

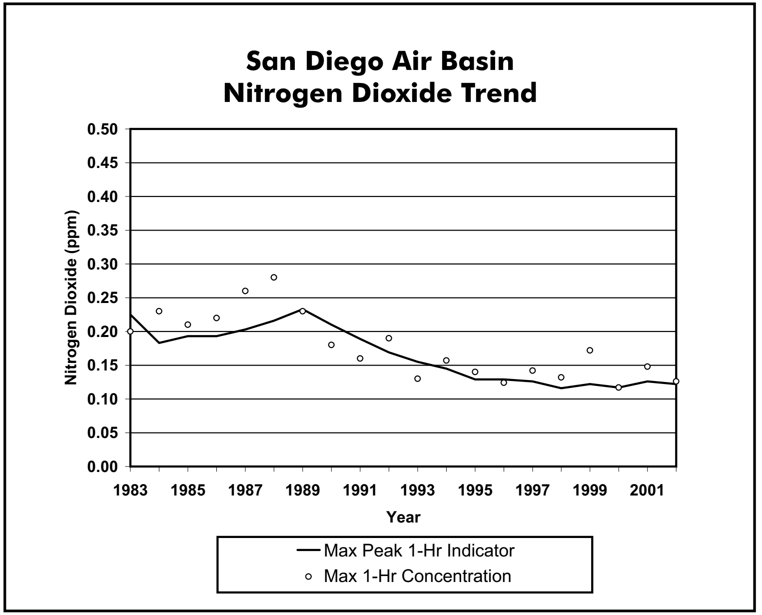

Figure 4-44

San Diego Air Basin

Nitrogen Dioxide Air Quality Table

NITROGEN DIOXIDE (ppm)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Peak 1-Hr. Indicator	0.225	0.183	0.193	0.193	0.203	0.216	0.233	0.210	0.189	0.169	0.155	0.145	0.129	0.129	0.126	0.116	0.122	0.117	0.126	0.122
Max. 1-Hr. Concentration	0.200	0.230	0.210	0.220	0.260	0.280	0.230	0.180	0.160	0.190	0.130	0.157	0.140	0.124	0.142	0.132	0.172	0.117	0.148	0.126
Max. Annual Average	0.027	0.031	0.032	0.030	0.032	0.035	0.031	0.029	0.029	0.027	0.023	0.024	0.026	0.022	0.024	0.023	0.026	0.024	0.022	0.022

Table 4-36

Sacramento Valley Air Basin

Introduction - Area Description

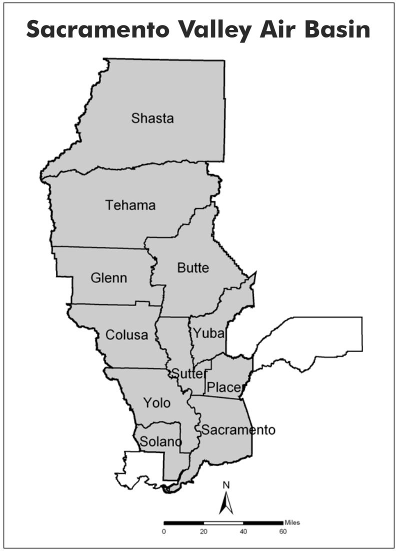

Figure 4-45

The Sacramento Valley Air Basin is home to California's capital. Located in the northern portion of the Central Valley, the Sacramento Valley Air Basin includes Butte, Colusa, Glenn, Sacramento, Shasta, Sutter, Tehama, Yolo, and Yuba counties, the western urbanized portion of Placer County, and the eastern portion of Solano County. The Sacramento Valley Air Basin occupies 14,994 square miles and has a population of more than two million people.

Because of its inland location, the climate of the Sacramento Valley Air Basin is more extreme than the climate in the San Francisco Bay Area Air Basin or South Coast Air Basin. The winters are generally cool and wet, while the summers are hot and dry.

Emissions from the urbanized portion of the basin (Sacramento, Yolo, Solano, and Placer Counties) dominate the emission inventory for the Sacramento Valley Air Basin, and on-road motor vehicles are the primary source of emissions in the metropolitan area. While pollutant concentrations have generally declined over the years, additional regulations will be needed to attain the State and national ambient air quality standards in this air basin.

Sacramento Valley Air Basin

Emission Trends and Forecasts

The emission levels in the Sacramento Valley Air Basin are trending downward from 1990 to 2010 for NO_x, and downward from 1975 to 2010 for ROG and CO. The decreases in NO_x, ROG, and CO are largely due to motor vehicle controls and reductions in evaporative emissions. Mobile sources (both on-road and other) are by far the largest contributors to NO_x, ROG, and CO emissions in the Sacramento Valley Air Basin. PM_{10} and $PM_{2.5}$ emissions are increasing from 1975 to 2010.

Sacramento Valley Air Basin

Population and VMT

Between 1980 and 2010, population in the Sacramento Valley Air Basin is projected to grow at a higher rate than the statewide average--a 94 percent increase compared with a 69 percent increase statewide. Population is projected to grow from 15 million in 1980 to 29 million in 2010. During this same period, the increase in the number of vehicle miles traveled each day is projected to be higher than the overall statewide value: a 152 percent increase in the Sacramento Valley Air Basin. VMT is projected to increase from nearly 28 million miles in 1980 to 70 million miles in 2010. While the actual population and VMT totals for the Sacramento Valley Air Basin are much smaller than those for the South Coast Air Basin and San Francisco Bay Area Air Basin, they are important because motor vehicles are a significant source of emissions in the Sacramento Valley Air Basin.

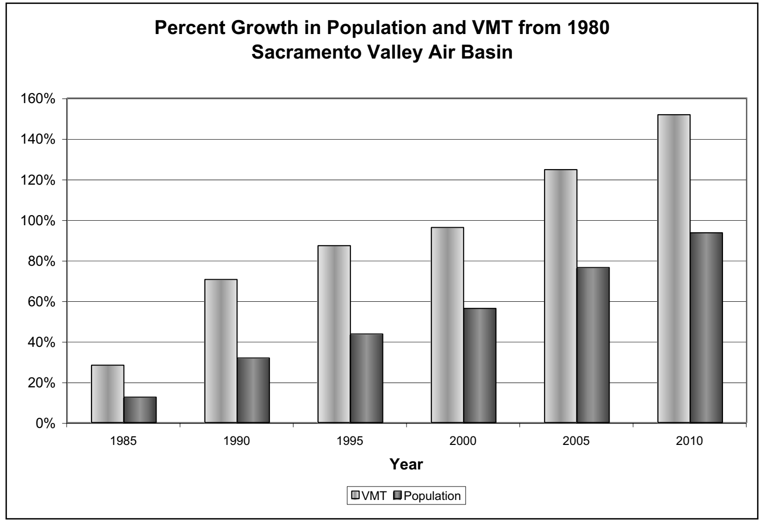

Figure 4-46

Sacramento Valley Air Basin
Ozone Precursor Emission Trends and Forecasts

Emissions of NO_x show a steady decrease from 1990 to 2010. On-road motor vehicles and other mobile sources are by far the largest contributors to NO_x emissions. More stringent mobile source emission standards and cleaner burning fuels have largely contributed to the decline in NO_x emissions. ROG emissions have been decreasing for the last 30 years due to more stringent motor vehicle standards and new rules for control of ROG from various industrial coating and solvent operations.

NO_x Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***329***	***355***	***351***	***383***	***337***	***294***	***247***	***202***
Stationary Sources	36	30	29	43	45	39	40	42
Area-wide Sources	7	8	8	9	8	8	8	8
On-Road Mobile	179	194	208	216	182	147	113	80
Gasoline Vehicles	147	148	143	132	112	78	54	38
Diesel Vehicles	32	46	65	84	70	68	59	43
Other Mobile	107	124	107	115	102	99	86	72

Table 4-37

ROG Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***454***	***442***	***412***	***365***	***302***	***242***	***207***	***187***
Stationary Sources	88	64	58	59	48	37	39	43
Area-wide Sources	61	68	66	74	70	68	67	68
On-Road Mobile	272	268	243	180	130	86	62	44
Gasoline Vehicles	270	265	239	176	126	83	59	42
Diesel Vehicles	2	3	4	4	3	3	3	2
Other Mobile	33	42	45	52	54	52	39	32

Table 4-38

Sacramento Valley Air Basin
Ozone Precursor Emission Trends and Forecasts

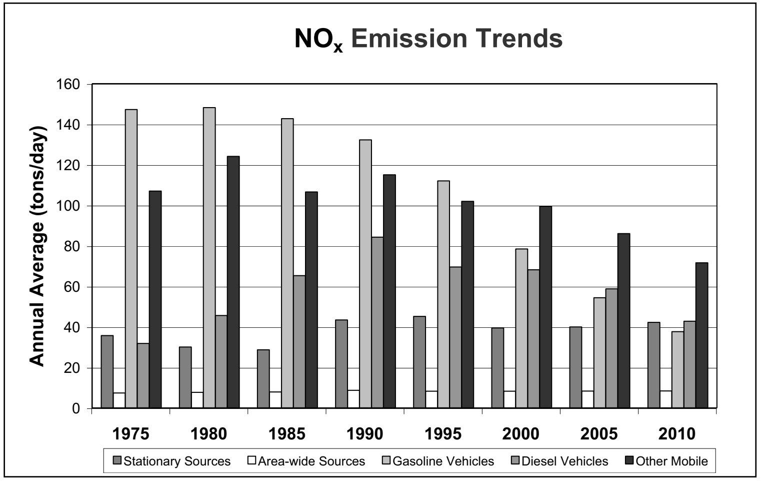

Figure 4-47

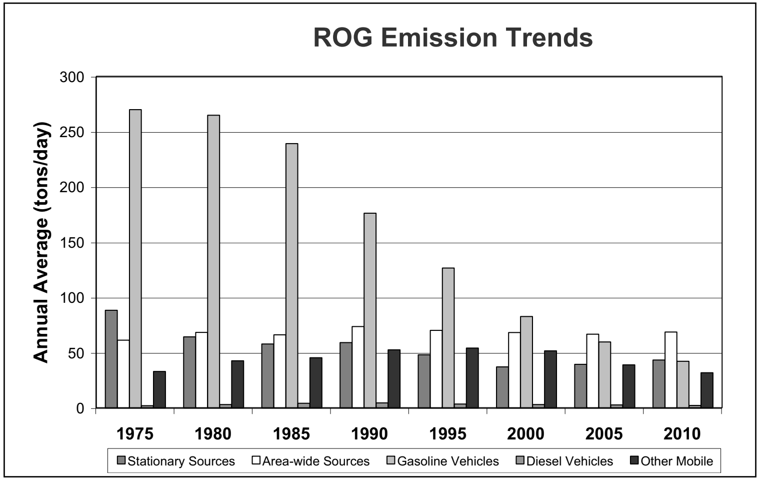

Figure 4-48

Sacramento Valley Air Basin

Ozone Air Quality Trend

Peak ozone values in the Sacramento Valley Air Basin have not declined as quickly over the last several years as they have in other urban areas. The maximum peak 1-hour indicator remained fairly constant from 1983 to 1988. Since 1988, the peak 1-hour indicator has decreased slightly, and the overall decline for the 21-year period is about 16 percent. Looking at the number of days above the State and national standards, the trend is much more variable. However, the number of exceedance days has declined since 1988. The maximum measured 1-hour concentrations have also decreased, but with more year-to-year variation.

Similar to the San Joaquin Valley, the urbanized portion of the Sacramento Valley Air Basin, along with urbanized portions of El Dorado and Placer Counties in the Mountain Counties Air Basin, is identified as both a transport contributor and receptor. The region is a transport contributor to the Mountain Counties, San Joaquin Valley, and San Francisco Bay Area Air Basins, and a receptor for the San Francisco Bay Area and San Joaquin Valley Air Basins.

New to the almanac this year is a table summarizing the Sacramento Metropolitan Area. This area reflects the portion of the region that is nonattainment for the national ozone standards.

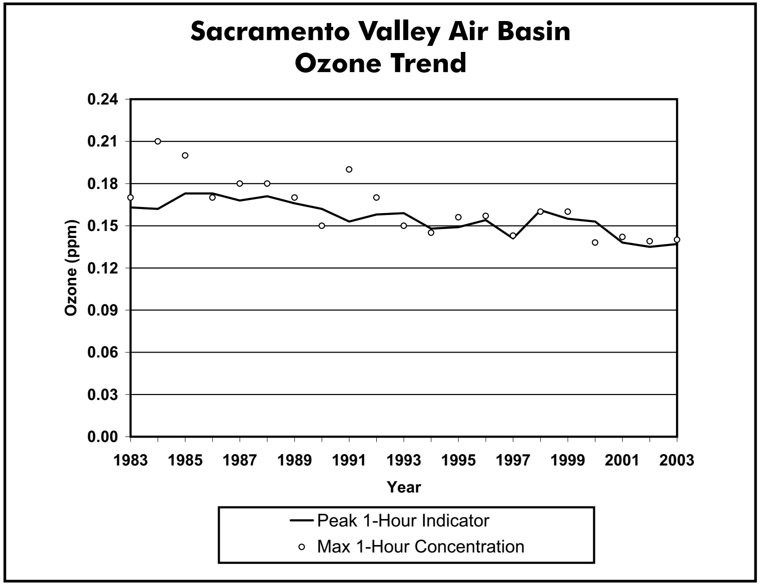

Figure 4-49

Sacramento Valley Air Basin

Ozone Air Quality Table

OZONE (ppm)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Peak 1-Hour Indicator	0.163	0.162	0.173	0.173	0.168	0.171	0.166	0.162	0.153	0.158	0.159	0.148	0.149	0.154	0.141	0.161	0.155	0.153	0.138	0.135	0.137
4th High 1-Hr in 3 Yrs	0.160	0.180	0.180	0.180	0.160	0.160	0.160	0.160	0.150	0.150	0.150	0.143	0.145	0.145	0.133	0.148	0.148	0.148	0.133	0.132	0.138
Avg of 4th Hi 8-Hr in 3 Yrs	0.114	0.115	0.118	0.118	0.114	0.114	0.114	0.107	0.105	0.105	0.110	0.104	0.106	0.106	0.097	0.097	0.101	0.105	0.101	0.101	0.100
Maximum 1-Hr. Concentration	0.170	0.210	0.200	0.170	0.180	0.180	0.170	0.150	0.190	0.170	0.150	0.145	0.156	0.157	0.143	0.160	0.160	0.138	0.142	0.139	0.140
Max. 8-Hr. Concentration	0.125	0.138	0.161	0.125	0.127	0.130	0.133	0.127	0.140	0.122	0.120	0.121	0.128	0.126	0.107	0.137	0.129	0.108	0.108	0.120	0.118
Days Above State Standard	62	64	59	66	94	98	68	50	68	74	34	60	50	58	25	62	59	42	46	47	51
Days Above Nat. 1-Hr. Std.	15	23	19	24	24	35	8	16	14	14	7	9	11	9	3	14	7	5	2	7	5
Days Above Nat. 8-Hr. Std.	44	46	42	50	73	68	37	44	60	56	22	48	40	44	15	60	43	35	37	34	40

Table 4-39

Sacramento Metropolitan Area[1]

Ozone Air Quality Table

OZONE (ppm)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Peak 1-Hour Indicator	0.163	0.162	0.173	0.173	0.168	0.171	0.166	0.162	0.153	0.158	0.159	0.148	0.149	0.154	0.141	0.161	0.155	0.153	0.139	0.143	0.146
4th High 1-Hr in 3 Yrs	0.160	0.180	0.180	0.180	0.160	0.160	0.160	0.160	0.150	0.150	0.150	0.143	0.145	0.145	0.133	0.148	0.148	0.148	0.133	0.143	0.143
Avg of 4th Hi 8-Hr in 3 Yrs	0.114	0.115	0.118	0.118	0.114	0.114	0.114	0.107	0.105	0.105	0.110	0.104	0.106	0.106	0.099	0.103	0.103	0.107	0.104	0.106	0.107
Maximum 1-Hr. Concentration	0.170	0.210	0.200	0.170	0.180	0.180	0.170	0.150	0.190	0.170	0.150	0.145	0.156	0.157	0.145	0.163	0.160	0.138	0.148	0.156	0.145
Max. 8-Hr. Concentration	0.125	0.138	0.161	0.125	0.127	0.138	0.133	0.127	0.140	0.122	0.120	0.121	0.128	0.126	0.107	0.137	0.129	0.113	0.109	0.137	0.122
Days Above State Standard	60	63	54	57	86	97	74	47	65	76	36	54	52	58	25	49	56	46	52	59	53
Days Above Nat. 1-Hr. Std.	15	22	19	23	22	35	9	14	14	14	7	9	11	11	4	13	7	7	3	10	6
Days Above Nat. 8-Hr. Std.	43	46	37	49	64	72	53	43	57	55	24	42	42	48	19	34	48	37	41	47	43

[1] The Sacramento Metropolitan Area includes urbanized portions of the Sacramento Valley Air Basin (Sacramento, Yolo, Placer, and Solano Counties, and part of Sutter County) and all of El Dorado and Placer Counties in the Mountain Counties Air Basin.

Table 4-40

Sacramento Valley Air Basin
Directly Emitted PM_{10} Emission Trends and Forecasts

Direct emissions of PM_{10} are increasing in the Sacramento Valley Air Basin between 1975 and 2010. Emissions are dominated by contributions from area-wide sources, primarily fugitive dust from paved and unpaved roads, fugitive dust from construction and demolition, and particulates from residential fuel combustion. Emissions of directly emitted PM_{10} from mobile sources and stationary sources in the Sacramento Valley Air Basin have remained relatively steady.

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NOx, SOx, ROG, and ammonia (secondary PM). The PM_{10} emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted PM_{10} emissions contribute approximately 75 percent of the ambient PM_{10} in the Sacramento Valley Air Basin.

Directly Emitted PM_{10} Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***194***	***202***	***209***	***223***	***215***	***223***	***231***	***238***
Stationary Sources	25	19	17	21	17	17	17	19
Area-wide Sources	160	172	181	189	188	197	204	210
On-Road Mobile	3	4	5	5	4	4	4	4
Gasoline Vehicles	1	1	1	2	2	2	2	3
Diesel Vehicles	2	2	3	4	2	2	1	1
Other Mobile	7	8	7	7	6	6	6	6

Table 4-41

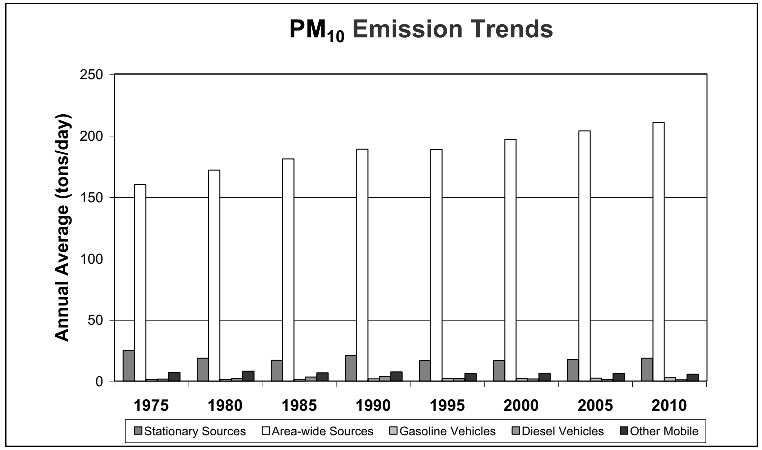

Figure 4-50

Sacramento Valley Air Basin

Directly Emitted $PM_{2.5}$ Emission Trends and Forecasts

Direct emissions of $PM_{2.5}$ are increasing in the Sacramento Valley Air Basin between 1975 and 2010. Emissions are dominated by contributions from area-wide sources, primarily fugitive dust from paved and unpaved roads, fugitive dust from construction and demolition, and particulates from residential fuel combustion. Emissions of directly emitted $PM_{2.5}$ from mobile sources and stationary sources in the Sacramento Valley Air Basin have remained relatively steady.

Particulate matter can be directly emitted into the air (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as NOx, SOx, ROG, and ammonia (secondary PM). The $PM_{2.5}$ emission inventory includes only directly emitted particulate emissions. On an annual average basis, directly emitted $PM_{2.5}$ emissions contribute approximately 70 percent of the ambient $PM_{2.5}$ in the Sacramento Valley Air Basin.

Directly Emitted $PM_{2.5}$ Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***85***	***84***	***86***	***93***	***87***	***88***	***90***	***92***
Stationary Sources	18	12	11	13	10	10	11	12
Area-wide Sources	58	62	65	68	68	70	72	73
On-Road Mobile	2	3	4	4	3	3	3	2
Gasoline Vehicles	1	1	1	1	1	1	1	2
Diesel Vehicles	1	2	3	3	2	2	1	1
Other Mobile	6	7	6	7	5	5	5	5

Table 4-42

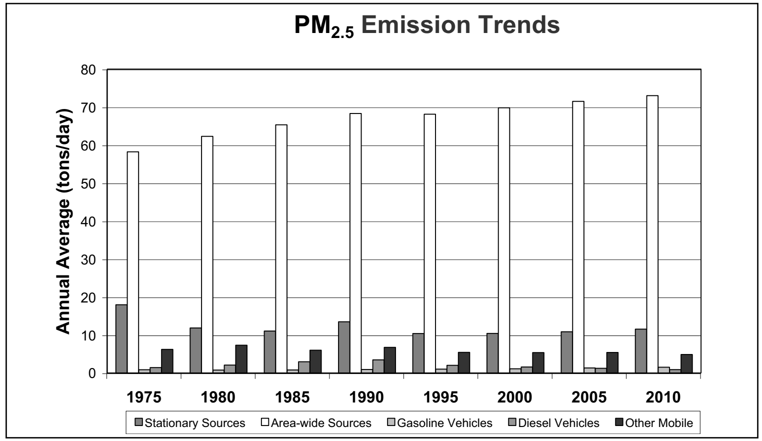

Figure 4-51

Sacramento Valley Air Basin

PM_{10} Air Quality Trend

The maximum annual average of quarters in the Sacramento Valley Air Basin show a fairly steady decline over the trend period, with some variability over the last several years. The maximum annual average of quarters (state) shows a decrease of about 24 percent from 1989 to 2002. The number of exceedance days also decreased. During 1988, there were 183 calculated exceedance days of the State 24-hour standard, compared with 126 days during 2002. Because many of the sources that contribute to ozone also contribute to PM_{10}, future ozone emission controls should improve PM_{10} air quality.

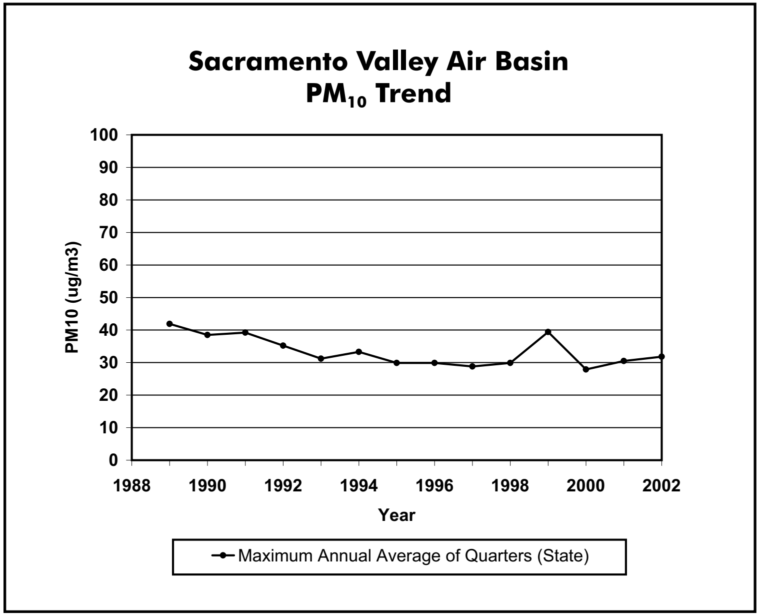

Figure 4-52

Sacramento Valley Air Basin

PM_{10} Air Quality Table

PM_{10} (ug/m3)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Max. 24-Hour Concentration (State)						100	147	153	136	111	113	154	145	98	126	130	179	90	112	96
Max. 24-Hr. Concentration (Nat)						115	139	153	136	111	110	154	145	98	126	130	179	86	105	92
Max. Annual Avg of Qrtrs (State)							41.9	38.5	39.2	35.2	31.2	33.3	29.9	29.9	28.8	29.9	39.4	27.9	30.5	31.8
Max. Annual Avg of Qrtrs (Nat)						42.8	41.9	41.7	42.3	34.7	31.8	34.5	30.1	29.8	28.6	29.0	38.4	27.9	30.2	30.9
Calc Days Above State 24-Hr Std						183	134	175	189	177	92	108	108	129	65	97	144	81	96	126
Calc Days Above Nat 24-Hr Std						0	0	0	0	0	0	0	0	0	0	0	6	0	0	0

Table 4-43

Sacramento Valley Air Basin
Carbon Monoxide Emission Trends and Forecasts

Emissions of CO are declining in the Sacramento Valley Air Basin between 1980 and 2010. Motor vehicles are the largest source of CO emissions. With the introduction of new automotive emission controls to meet more stringent emission standards, motor vehicle CO emissions have been declining since 1975, despite increases in vehicle miles traveled (VMT). Stationary and area-wide source CO emissions have remained relatively steady, with additional emission controls offsetting growth.

CO Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***2968***	***2979***	***2849***	***2515***	***1901***	***1489***	***1228***	***1040***
Stationary Sources	27	28	16	51	39	48	50	54
Area-wide Sources	292	307	319	331	329	331	334	337
On-Road Mobile	2450	2389	2246	1813	1225	822	576	398
Gasoline Vehicles	2442	2377	2228	1793	1210	808	565	389
Diesel Vehicles	8	12	17	20	16	13	12	9
Other Mobile	199	255	269	320	307	288	267	252

Table 4-44

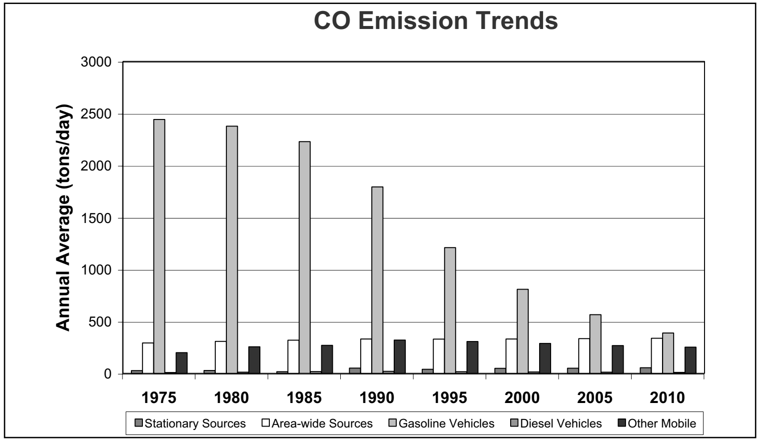

Figure 4-53

Sacramento Valley Air Basin
Carbon Monoxide Air Quality Trend

The trend of the maximum peak 8-hour indicator for carbon monoxide for the Sacramento Valley Air Basin was relatively flat from 1983 to 1991, with some year-to-year variability that was probably caused by meteorology. Since 1991, indicator values have decreased substantially. The 2002 value was about 59 percent lower than the 1991 value. The number of days above the State and national standards is even more variable. However, these indicators also show an overall downward trend. The national CO standards have not been exceeded since 1991, and the State standards were last exceeded in 1993. Much of the decline in ambient carbon monoxide concentrations is attributable to the introduction of cleaner fuels and newer, cleaner motor vehicles. These controls will help keep the area in attainment for both the State and national CO standards.

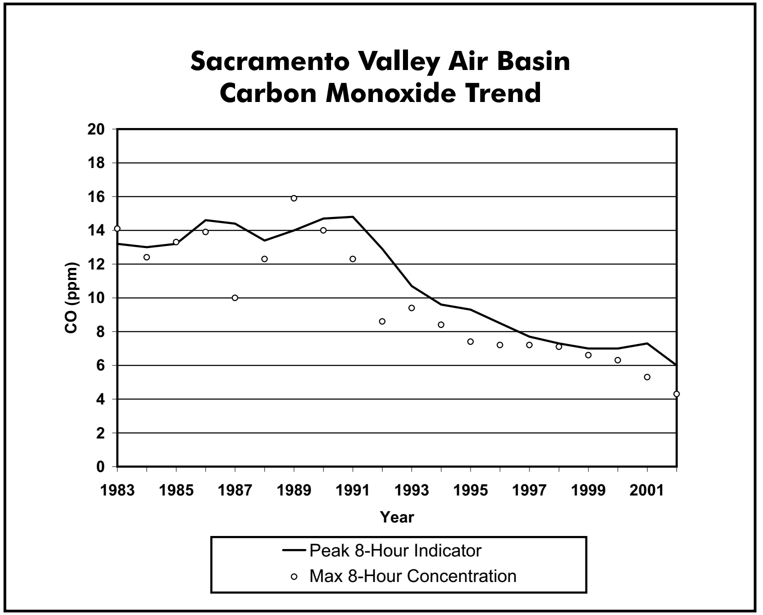

Figure 4-54

Sacramento Valley Air Basin

Carbon Monoxide Air Quality Table

CARBON MONOXIDE (ppm)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Peak 8-Hr. Indicator	13.2	13.0	13.2	14.6	14.4	13.4	14.0	14.7	14.8	12.9	10.7	9.6	9.3	8.5	7.7	7.3	7.0	7.0	7.3	6.0
Max. 1-Hr. Concentration	19.0	18.0	17.0	20.0	15.0	17.0	18.0	17.0	15.0	14.0	12.0	10.8	9.8	8.7	9.5	7.9	7.7	10.0	19.1	7.8
Max. 8-Hr. Concentration	14.1	12.4	13.3	13.9	10.0	12.3	15.9	14.0	12.3	8.6	9.4	8.4	7.4	7.2	7.2	7.1	6.6	6.3	5.3	4.3
Days Above State 8-Hr. Std.	6	6	12	13	5	12	22	14	9	0	2	0	0	0	0	0	0	0	0	0
Days Above Nat. 8-Hr. Std.	4	5	12	12	3	9	22	12	6	0	0	0	0	0	0	0	0	0	0	0

Table 4-45